4.4 HUMAN ENVIRONMENT

4.4.1 Cultural Resources

This subsection evaluates the probable effects of implementing the alternatives on the following cultural resources: archaeological resources, historic structures, ethnographic resources, and the cultural landscape (collectively referred to as "historic property"). This subsection describes the regulatory framework used for assessing the effects of the proposed alternatives on cultural resources; characterizes the direct, indirect, and cumulative effects of the proposed alternatives; discusses the potential for the proposed alternatives to impair the park's cultural resources and values; and provides a conclusion summarizing the results of this evaluation.

Issues of Concern Raised during Scoping. Information was sought from individuals and organizations, including Native American organizations. The issues identified during the scoping process include the following:

- air and water pollution could defile sacred elements of Glacier Bay, including the glaciers, mountain goats, and harbor seals.
- effects on harbor seals could change opportunities for traditional seal hunting.
- waves generated from vessels could erode portions of the shoreline, thus changing the geological composition of the shoreline, and possibly exposing anthropological and archaeological resources present in interstadial geologic layers, including preglacial forests.
- increase in traffic at popular drop-off locations could increase physical disturbances and potential vandalism of anthropological resources.

Regulatory Framework. The relevant regulations for this evaluation of effects on cultural resources are the National Environmental Policy Act and section 106 of the National Historic Preservation Act (NHPA). The National Environmental Policy Act requires a review of project and program effects on the cultural environment, which generally includes historic properties, other culturally valued places, cultural use of a biophysical environment, and sociocultural attributes (e.g., social cohesion, social institutions, lifeways, religious practices, and/or other cultural institutions). CEQ regulations require that the effects of alternatives and their component actions be disclosed. For this analysis, an effect is considered adverse (for section 106) and major (for the National Environmental Policy Act) when the effect diminishes the significant characteristics of a "historic property" to the extent that it is no longer considered eligible for the National Register of Historic Places.

Section 106 of the National Historic Preservation Act requires that prior to the approval of an undertaking, the lead federal agency must take into account the effects of the undertaking on "historic properties" and provide the Advisory Council on Historic Preservation (ACHP) with a reasonable opportunity to comment with regard to the undertaking. As defined by the National Historic Preservation Act (NHPA section 800.16[y]; 36 CFR 800.3[a][1]), an action is an undertaking if it is done by or for a federal agency; is carried out with federal assistance; requires a federal permit, license, or approval; or is subject to federal delegation or oversight. The evaluation process involves (NHPA, 16 USC 470a, Title I, section 101):

- the identification and evaluation of "historic properties" in the area of potential effect (APE).
- the identification and evaluation of the effects of the undertaking on "historic properties."
- the development and implementation of agreements (done in consultation with the state historic preservation office [SHPO] and other concerned parties) regarding the means by which adverse effects on such properties will be considered (e.g., the 1995 programmatic agreement among the Park Service, the Advisory Council on Historic Preservation, and the National Conference of Historic Preservation Officers [NCHPO]).
- the provision for the disposition of Native American cultural items from federal or tribal land in a manner consistent with Section 3(c) of the Native American Graves Protection and Repatriation Act (NAGPRA; 25 USC 3002[c]; NHPA section 110[a][2]).

Methodology and Assumptions. All parks, including those established primarily for their natural or recreational resources, have responsibilities to identify "historic properties" potentially affected by undertakings (NPS, ACHP, and NCHPO 1995). For the purposes of section 106 of the National Historic Preservation Act, "historic properties" are defined as prehistoric and historic districts, sites, buildings, structures, and objects listed or eligible for inclusion on the national register, including artifacts, records, and material remains related to the property (NHPA, 16 USC 470w, section 301.5). The Park Service subdivides cultural resources ("historic properties") into five categories: archaeological resources, prehistoric and historic structures, ethnographic resources, cultural landscapes, and museum objects (NPS 2001d, 1997a). For the purposes of this effects analysis, cultural resources are equivalent to "historic properties" and consist of four property types: archaeological resources, historic structural resources (HSR), ethnographic resources, and cultural landscapes; museum objects are not considered in this analysis (NPS 2002d).

The assessment of effects on cultural resources is based on the regulations of the Advisory Council on Historic Preservation (36 CFR 800). The steps involve:

1. determining whether the action being considered is an undertaking as defined by the National Historic Preservation Act.

2. coordinating with other reviews (e.g., NEPA, Native American Graves Protection and Repatriation Act, American Indian Religious Freedom Act [AIRFA], and Archaeological Resources Protection Act [ARPA]), identifying the state historic preservation officer and other likely consulting parties, and planning to involve the public.
3. identifying "historic properties" using the Secretary of the Interior's standards (36 CFR 800.4). This identification involves:
   - establishing the area of potential effect.
   - reviewing available data.
   - seeking information from others.
   - identifying issues.
   - gathering information from Native American organizations that may place a religious or cultural significance on "historic properties" (e.g., ethnographic resources/traditional cultural properties and cultural landscapes) in the area of potential effect.
   - evaluating all "historical properties" (e.g., cultural resources) for national register eligibility on the basis of their significance (e.g., historical, archaeological, and/or cultural; see 36 CFR 60.4).

The Park Service determined that the proposed action is an "undertaking." During the scoping process and the development of the section 106 consultation, the second and third steps were addressed. Although few formal determinations of eligibility have been made for historic properties in the park, all are considered potentially eligible for the national register. The EIS defined the area of potential effect as Glacier Bay and Dundas Bay. A literature search was completed to access available data.

Analysis of effects on the full range of historic properties varies with resource type. Potential effects on tangible resources (archaeological sites and historic structures) can be analyzed using physical parameters (e.g., cubic meters of erosion and intact structural components), whereas effects on the intangible aspects of ethnographic resources (traditional cultural properties [TCPs] and cultural landscapes) are quantifiable in terms of people's perceptions and assumed responses, and is, by nature, a much more subjective exercise. For example, a perception that the ethnographic resource is degraded (polluted and desanctified) may elicit a behavioral response of decreased visitation or cessation of traditional activities that could result in loss of knowledge of and cultural association with a site or sites — the key attributes that give traditional cultural properties and cultural landscapes their national register significance. In this regard, the Huna Tlingit perception of ecological "pristineness" is a paramount attribute in the connection they feel to their homeland, and the potential degree to which the proposed alternatives degrade that "pristineness," and therefore influence Huna Tlingit responses to them, determines the effects to be analyzed.

The cultural resources threshold criteria (see table 4-26) address the effects of the proposed alternatives on "historic properties" in the area of potential effect (e.g., archaeological, historic structural and ethnographic resources, and cultural landscapes). In the following analysis, "historic properties" in the area of potential effect were evaluated with respect to their eligibility for the national register and whether the effects due to the implementation of the proposed alternatives would change the eligibility of that "historic property." For a cultural resource (e.g., districts, sites, buildings, structures, and objects) to be eligible for the National Register of Historic Places, it must possess integrity of location, design, setting, materials, workmanship, feeling, and/or association. In addition, the cultural resource must:

- Á be associated with events that have made a significant contribution to the broad patterns of our history.
- Á be associated with the lives of persons significant in our past.
- Á embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.
- Á yield, or be likely to yield, information important in prehistory or history (36 CFR 60.4).

Table 4-26 lists the specific threshold criteria used in this evaluation.

TABLE 4-26: THRESHOLD CRITERIA FOR CULTURAL RESOURCES EFFECTS ANALYSIS

Negligible	Perceptible and/or measurable effect would not occur; effect would occur to a single "historic property"; any effect would last less than two years. The eligibility (e.g., integrity and association) of a "historic property" (i.e., cultural resource) eligible for or listed on the National Register of Historic Places would not be affected.
Minor	Perceptible and/or measurable effect would occur; effect would occur to a single "historic property"; effect would last less than two years. The eligibility (e.g., integrity and association) of a "historic property" (i.e., cultural resource) eligible for or listed on the National Register of Historic Places would not be affected.
Moderate	Perceptible and/or measurable effect would occur; more than one "historic property" or a district would be affected; duration would be two years or longer; the character of a "historic property" or district would be affected; the integrity and association of a "historic property" or district eligible for or listed on the National Register of Historic Places would be affected, but national register eligibility would not be affected.
Major	Perceptible and/or measurable effect would occur; multiple "historic properties" or a district would be affected; duration would be two years to permanent; the character of a "historic property" or district would be affected; the integrity and association of a "historic property" or district eligible for listing on the national register would be affected to the extent that it would no longer be eligible for listing on the National Register of Historic Places.

Alternative 1 (No Action) – Effects on Cultural Resources. Alternative 1 (the no-action alternative) would maintain current vessel quotas and operating requirements (1996 levels).

Direct and Indirect Effects on Cultural Resources – Alternative 1.

Archaeological and Historic Structural Resources. Archaeological resources are prehistoric Native American cultural resources and historic archaeological resources of Native American and Euro-American origin. Due to the geologic processes encountered in the park, most prehistoric archaeological sites are located on or near a terrace (e.g., the Spruce Terrace) that stands above and removed from the current beach and wake-affected zone. Historic structural resources are the remains of structures that housed humans and their activities in the past and listed on the List of Classified Structures. Historic structural resources are still standing; if collapsed or otherwise open to the elements, they fall into the archaeological resources category. The park's policy on historic structures, based on the 1984 general management plan (NPS 1984), outlined a policy of "benign neglect," directing the Park Service to allow historic structures to deteriorate naturally, eventually to be reclaimed by the landscape. According to the general management plan, these sites should be managed as "discovery sites" — with no on-site interpretation, reconstruction, or stabilization.

Nine archaeological sites in Glacier Bay were evaluated for effects of erosion and contamination (JUN-001, JUN-026, JUN-050, XMF-062, XMF-063, XMF-081, XMF-082, XMF-083, and XMF-084). The two historic structural resources documented for Glacier Bay, the Ibach Cabin and a shed in Reid Inlet, also were evaluated. Because the current effect of wakes on the coast is minimal (PND 2002) and no documented archaeological resources and historic structural resources are located in the wake-affected zones, vessel wakes would have a negligible effect on archaeological resources and historic structural resources located near the coast. Although accidental oil discharges / fuel spills could contaminate archaeological sites and historic structures along the coastlines of the park, the sites are sufficiently distant from the shoreline to be safe.

The duration of alternative 1 would be long-term. The area affected would be the waters and coastal areas of Glacier Bay and lower Dundas Bay. The effect on archaeological resources and historic structural resources would not be perceptible in vessel wake zones and would have no effect on national register eligibility for potentially eligible archaeological sites and historic structural resources. Given the park's current policy, the low number and ruinous condition of the documented historic structural resources in Glacier Bay, and the low potential for damage to undocumented historic structural resources and archaeological resources due to erosion from vessel wakes and contamination from oil discharges / fuel spills, alternative 1 would have negligible effects on archaeological and historic structural resources (see table 4-26).

Ethnographic Resources. Ethnographic resources consist of traditional arts, Native languages, religious beliefs, special places in the natural world, structures with historic associations, traditional cultural properties, natural materials, and consumptive uses (discussed in the next subsection; NPS 1997a). A traditional cultural property is a "historic property" that is eligible for inclusion on the National Register of Historic Places because of its association with cultural practices or beliefs of a living community that are rooted in that community's history and important in maintaining the continuing cultural identity of the community (Parker and King 1998a; NPS 2001d). For a discussion of ethnographic resources / traditional cultural properties, see subsection 3.4.1, "Cultural Resources."

Huna Tlingit culture is a recognized ethnographic cultural resource in the park (Howell 2002). The Huna Tlingit perceive Glacier Bay to be the cradle of their culture. It is the place where the Huna Tlingit evolved from the animals, mountains, and ice; gave identity to Huna Tlingit clans; and gives order to Huna Tlingit social relations, today and into the future. Glacier Bay has sustained the Huna Tlingit nutritionally and spiritually for generations. The Huna Tlingit refer to Glacier Bay as their most important place, their "homeland," their "Ice Box," their "Garden of Eden," and their "Holy Land." The Huna Tlingit believe that it is imperative that the ancestral homeland remains unpolluted, and that the subsistence food base remains pure (Hoonah Indian Association [HIA] 2002). Continued access, participation in traditional cultural activities rooted in the park, and intergenerational transference of the cultural meanings of ancestral places in the park maintain the continuing cultural associations with Glacier Bay and the Huna Tlingit's cultural identity. See subsection 3.4.1, "Cultural Resources," for further discussion about the Huna Tlingit relationship with Glacier Bay.

From the perspective of the Huna Tlingit (scoping), alternative 1 would affect ethnographic resources in the park by the diminution of the quality of resources, and thus degrade the Huna Tlingit ancestral homeland. If the ancestral homeland is degraded by air or water pollution, the threat of a fuel spill, or other perceived degrading vectors, Huna Tlingits may become disconnected from their homeland and may become disinclined to visit and conduct traditional activities. Therefore, relationships with the homeland are susceptible to deterioration, resulting in the erosion of cultural identity. Continued cultural identity of the community with ethnographic resources (i.e., traditional cultural properties) is necessary for national register eligibility. Conversely, a lack of cultural identity with ethnographic resources results in ineligibility for the national register. Currently, the Huna Tlingit have retained their cultural identity with Glacier Bay.

Six potential traditional cultural properties in Glacier Bay were evaluated for potential effects of alternative 1 (TCP ID #1 [Bartlett Cove], TCP ID #2 [Pt. Gustavus], TCP ID #4 [Berg Bay], TCP ID #5 [South Marble Island], TCP ID #6 [Sealer's Island], and TCP ID #7 [Tidewater Glaciers]. The Huna Tlingit believe that they are "stewards" of Glacier Bay and have expressed concerns about the effects of contamination (air and water pollution) and harm or displacement of marine mammals (e.g., seals and whales) associated with cruise ships (HIA 2002). Alternative 1, while supported by the Hoonah Indian Association (HIA 2002), may have a moderate effect on the ethnographic landscape (e.g., traditional cultural properties) in that it would affect the relationship between the Huna Tlingit and the traditional cultural properties because cruise ships and other vessels lessen the perceived environmental quality of the park.

The effect of alternative 1 would be long-term, would encompass all of Glacier Bay, and would potentially affect the integrity and association of eligible or potentially eligible ethnographic resources / traditional cultural properties in Glacier and Dundas Bays; however, the effects of alternative 1 would not affect these ethnographic resources' eligibility for the national register because the Huna are likely to maintain their cultural identity with Glacier Bay. As long as the community maintains its cultural identity with traditional Glacier Bay places and activities, the ethnographic resource (e.g., traditional cultural properties) will continue to be eligible for the national register. Thus, the effect of alternative 1 on ethnographic resources would be moderate (see table 4-26).

Cultural Landscapes. Cultural landscapes are "historic properties" that are geographic areas, including natural and cultural resources, associated with historic events, activities, and/or people. At the broadest scale, the cultural landscape encompasses entire landscapes (e.g., the entirety of Glacier Bay) or component landscapes (e.g., Dundas Bay or Bartlett Cove). The following discussion summarizes environmental consequences of alternative 1 on cultural landscapes in Glacier and Dundas Bays. For further discussion of cultural landscapes, see subsection 3.4.1.

The effects analysis for ethnographic resources also applies to cultural landscapes, because the cultural landscape is an extension of the ethnographic resource. The Glacier Bay cultural landscape is a compilation of all landscape features, cultural resources, and natural resources that combined have meaning and significance to the Huna Tlingit. Alienation of the Huna Tlingit from the resources and landscape of the park would change their relationship to their homeland, their traditional places, and the basis of their cultural identity. The effect of alternative 1 would be long-term, would encompass all of Glacier Bay, and may affect the integrity and association of eligible or potentially eligible cultural

landscapes in Glacier and Dundas Bays. Effects of alternative 1, however, would not affect these cultural landscapes' eligibility for the national register because the Huna are likely to maintain their cultural identity with Glacier Bay. Alternative 1 would have a moderate effect on cultural landscapes (see table 4-26).

Cumulative Effects on Cultural Resources – Alternative 1. Passengers offloaded from tour and charter vessels, kayakers, and other backcountry visitors have the potential to cumulatively alter eligibility of cultural resources for the national register through looting, vandalism, and/or unintentional damage to cultural resources. The Park Service has reported minor vandalism at exposed cultural resource sites (NPS 1995a).

Due to the effects of alternative 1, the Huna Tlingit may perceive diminished opportunities for spiritually connecting with their landscape and sharing their culture with others due to the perceived diminished integrity of their ancestral homeland as park use increases (i.e., more vessels and tourists result in a less pristine environment). Increases in vessel and visitor traffic to the park have the potential to further alienate the Huna Tlingit from their ancestral homeland by diminishing the quality of the relationship between the Huna Tlingit and the park. If this effect is severe enough that the relationships with the cultural resources (e.g., ethnographic resources and cultural landscapes) decline to the point that there is no cultural identity with them, these resources and landscapes would no longer be eligible for the national register.

The Huna Tlingit believe they have been alienated or expelled from the park due to park designation, subsistence limitations, and prior access limitations (e.g., some Huna Tlingit are unwilling to compete for limited private vessel entry permits during the busy summer season; Howell 2002). Huna Tlingit access issues are being resolved through government-to-government negotiations between the Park Service and the Hoonah Indian Association. The Park Service has been working with the Huna Tlingit to encourage participation in currently authorized activities, such as berry picking and fishing, while exploring resumption of others, such as gull-egg gathering. These negotiations, in addition to multiple studies, educational programs, and increased Huna Tlingit participation in all aspects of park planning and management, illustrate the importance of Tlingit culture in the mission and purpose of the park.

Impairment Analysis for Cultural Resources – Alternative 1. An effect may constitute an impairment "to the extent that it affects a resource or value whose conservation is necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; key to the natural or cultural integrity

of the park or to opportunities for enjoyment of the park; or identified as a goal in the park's general management plan or other relevant NPS planning documents" (NPS 2000b). The park's purpose and mission statement states that the park will recognize and perpetuate "values associated with the Tlingit homeland"; preserve "historic value"; protect, restore, and maintain "cultural resources and [their] associated values in good condition"; and manage these "resources within their broader ecosystem and cultural context" (NPS 1997c, 1998a).

Based on the overall severity (moderate), duration (long-term), and timing of the effect (June through August); the effects of alternative 1 on ethnographic resources and cultural landscapes (e.g., perception of degradation of connection to the ethnographic resource and/or cultural landscape); and the cumulative effects of alternative 1 (moderate; NPS 2000b), alternative 1 would not result in impairment of cultural resources in the park.

Potential Mitigation Measures for Cultural Resources – Alternative 1. Continuing visitor education regarding the effects of intentional and unintentional damage to archaeological resources and closing sensitive areas to visitor use could mitigate the effects of minor vandalism at exposed cultural resource sites, as discussed in the cumulative effects subsection.

Conclusion, Cultural Resources – Alternative 1. The potential effects of alternative 1 would be negligible for eligible or potentially eligible archaeological and historic structural resources, but moderate for eligible or potentially eligible ethnographic resources (e.g., traditional cultural properties) and cultural landscapes due to the unavoidable perceived degradation of the Huna Tlingit homeland by vessel traffic. The overall effect of alternative 1 on cultural resources would be moderate. The cumulative effect of alternative 1 would be moderate. Alternative 1 would not impair cultural resources in the park.

Alternative 2 – Effects on Cultural Resources. Under this alternative, vessel management would revert to the quotas and operating requirements established in 1985, reversing the increases defined in the 1996 decision (107 cruise ships between June 1 and August 31). Alternative 2 represents a decrease in vessel traffic from alternative 1.

Direct and Indirect Effects on Cultural Resources – Alternative 2.

Archaeological and Historic Structural Resources. The potential changes to archaeological resources and historic structural resources as a result of alternative 2 are the same as those of alternative 1. As described

under alternative 1, the effects of vessel wakes and potential fuel spills would be negligible because the known archaeological and historic structural resources are physically above the area affected by wave/wake action. Alternative 2 would have no effect on national register eligibility for potentially eligible archaeological sites and historic structural resources, and would have a negligible effect on known archaeological resources and historic structural resources despite the long duration and large area of potential effect (see table 4-26).

Ethnographic Resources. Alternative 2 would have a moderate effect on ethnographic resources. Although alternative 2 would decrease cruise ship traffic from alternative 1, and thus present a reduced threat of pollution (air and water), contamination (fuel spills), and marine mammal injuries — factors that could enhance the Huna Tlingit relationship with their homeland — the reduction is not sufficient to reduce the effect to minor, because those potential threats would still be noticeably present. Alternative 2 would not affect the integrity and association of the eligible or potentially eligible ethnographic resources and would not effect their eligibility for the national register because the Huna Tlingit are likely to maintain their cultural identity with Glacier Bay. Thus, the effect of alternative 2 on ethnographic resources would be moderate (see table 4-26).

Cultural Landscape. Alternative 2 would have a moderate effect on cultural landscapes in Glacier Bay because the Huna Tlingit have maintained their connection to the Bartlett Cove cultural landscape as discussed in alternative 1. Although the effects of alternative 2 on the Glacier Bay cultural landscapes would be long-term and encompass all of Glacier Bay, they would not affect the integrity and association of eligible or potentially eligible cultural landscapes in Glacier Bay and thus would not affect these cultural landscapes' eligibility for the national register. Thus, Alternative 2 would have a moderate effect on the Glacier Bay cultural landscape (see table 4-26).

Cumulative Effects on Cultural Resources – Alternative 2. Alternative 2 would have the same cumulative effects as alternative 1; however, the cumulative effects would be reduced due to the proposed decrease in vessel traffic/quotas.

Impairment Analysis for Cultural Resources – Alternative 2. Though the duration is long-term, the overall severity of the alternative 2 effect is negligible for archaeological and historic structural resources and moderate for ethnographic resources and cultural landscapes. Thus, no impairment to these resources would result from alternative 2.

Potential Mitigation Measures for Cultural Resources – Alternative 2. The effect on ethnographic resources and the cultural landscape could be mitigated by the formation of a task force comprising of the Hoonah Indian Association and NPS officials. This task force would identify potential adverse effects in the park and design a cooperative management plan to address them.

Conclusion, Cultural Resources – Alternative 2. The potential effects of alternative 2 would be negligible for eligible or potentially eligible archaeological and historic structural resources, and moderate for eligible or potentially eligible ethnographic resources (e.g., traditional cultural properties) and cultural landscapes. The overall effect of alternative 2 on cultural resources would be moderate. The cumulative effects of alternative 2 would be minor. Alternative 2 would not result in impairment to cultural resources.

Alternative 3 – Effects on Cultural Resources. Alternative 3 allows for an increase in vessel traffic up to the quotas authorized in the 1996 vessel management plan (or two ships a day, every day, from June 1 through August 31). Alternative 3 proposes a 32% increase in vessel traffic/quotas from alternative 1.

Direct and Indirect Effects on Cultural Resources – Alternative 3.

Archaeological and Historic Structural Resources. Despite the increase in vessel traffic/quotas proposed under alternative 3, the effects to archaeological resources and historic structural resources would be the same as those of alternative 1. As with alternative 1, archaeological and historic structural resources in Glacier Bay could be disturbed or destroyed by erosion caused by cruise-ship-induced wakes on coastal archaeological and historic sites and contamination from possible oil discharge or fuel spills. According to subsection 4.4.6, "Coastal/Shoreline Environments and Biological Communities," the erosion potential would be the same as that for alternative 1, and although erosion would increase slightly, there would be no visible changes to the shoreline. The wave action and the potential for contamination to these resources, therefore, are the same as those of alternative 1, and the effect on archaeological resources and historic structural resources would be negligible.

Ethnographic Resources. Alternative 3 would have a moderate effect on the ethnographic resources in Glacier Bay because it would increase the effects from alternative 1 due to the 32% increase in vessel traffic/quotas. Under existing conditions, the Huna Tlingit perceive the environment of the park as degraded as described under alternative 1. Because of the vessel increase, alternative 3 has the potential to have a moderate effect on ethnographic resources (e.g., traditional cultural properties) in that it could adversely affect the relationship between the Huna Tlingit and the traditional cultural properties if cruise

ships further degrade perceived environmental quality in the park; however, the level of increase would not be sufficient to cause Huna Tlingits to abandon such ingrained cultural traditions.

Alternative 3 could potentially affect the integrity and association of eligible or potentially eligible ethnographic resources to the extent that perceived degradation of the environment reduces the integrity of the Huna Tlingit relationship with their homeland. Alternative 3 would not affect these ethnographic resources' eligibility for the national register, however, because the Huna Tlingit are likely to maintain their cultural identity with Glacier Bay. As long as the community maintains its cultural identity with traditional Glacier Bay places and activities, the ethnographic resource (e.g., traditional cultural properties) will continue to be eligible for the national register. Thus, the effects of alternative 3 on ethnographic resources would be moderate.

Cultural Landscape. Alternative 3 would have a moderate effect on cultural landscapes because cultural landscapes are an extension of ethnographic resources and the Huna Tlingit have maintained their connection to the Bartlett Cove cultural landscape (see alternative 1).

Cumulative Effects on Cultural Resources – Alternative 3. Alternative 3 would have a similar cumulative effect as alternative 1, although the effect would be somewhat greater due to the increase in vessel traffic/quotas. The cumulative effects of the actions external to this plan (e.g., increased tourism, tourists who go ashore, restricted access to the park, and subsistence limitations) could significantly alter the effects on the cultural resources of Glacier Bay and Dundas Bay; therefore, the cumulative effect would be moderate.

Impairment Analysis for Cultural Resources – Alternative 3. Despite the long duration, the overall severity of the effect on archaeological and historic structural resources for alternative 3 is negligible. For ethnographic resources and cultural landscapes, the severity of the effect is moderate, the duration is long-term, the timing of the effect is June through August (a period of Huna Tlingit use of the park), the effects include Huna Tlingit perception of a diminution of their connection to their homeland, and the cumulative effects would be moderate (see table 4-26). Because the overall severity of alternative 3 is moderate**,** this alternative would not result in impairment on cultural resources in the park.

Potential Mitigation Measures for Cultural Resources – Alternative 3. The effect on ethnographic resources and the cultural landscape could be mitigated by the formation of a task force comprising the

Hoonah Indian Association and NPS officials. This task force would identify potential adverse effects in the park and design a cooperative management plan to address them.

Conclusion, Cultural Resources – Alternative 3. The potential effects of alternative 3 would be negligible for eligible or potentially eligible archaeological and historic structural resources, but moderate for eligible or potentially eligible ethnographic resources (e.g., traditional cultural properties) and cultural landscapes. The overall effect of alternative 3 on cultural resources would be moderate. The cumulative effects of alternative 3 would be moderate. Alternative 3 would not result in impairment to cultural resources in the park.

Alternative 4 – Effects on Cultural Resources. Alternative 4 decreases cruise ship vessel quotas to pre-1985 levels and reduces daily vessel quotas for tour, charter, and private vessels from the current conditions. Alternative 4 extends the vessel seasonal restrictions for all vessel classifications to May 1 (instead of June 1) until September 30 (instead of August 31), proposes vessel quotas for charter vessels in Dundas Bay (a daily vessel quota of 3 and a seasonal-use day limit of 459), restricts tour vessels from entering Dundas Bay, closes wilderness waters to cruise ships and tour vessels and proposes to identify a cruise ship route. This alternative also modifies vessel-operating requirements (e.g., vessel speeds, whale water boundaries, and vessel operations).

Direct and Indirect Effects on Cultural Resources – Alternative 4.

Archaeological and Historic Structural Resources. Alternative 4 would have a negligible effect on archaeological resources through erosion or contamination. The effects of alternative 4 on archaeological resources in Glacier Bay would be less than those of alternative 1 (which are negligible) due to a longer but restricted entry season, slower vessel speeds, and additional restricted waters. Alternative 4 could affect, through vessel wakes and contamination, 15 coastal archaeological sites in Dundas Bay, nine archaeological sites in Glacier Bay, and four historic structural resources in Dundas Bay (see figure 3-18). As with the other alternatives, because the known archaeological and historic structural resources within Glacier and Dundas Bays are located above the wake zone, there would be a negligible effect from vessel wakes and oil discharge or fuel spills. This alternative also would have a negligible effect on archaeological and historic structural resources in Dundas Bay because charter traffic is more limited under this alternative than with current conditions. Alternative 4 would have no effect on national register eligibility for potentially eligible archaeological sites and historic structural resources and thus would

have a negligible effect on archaeological resources and historic structural resources despite the long duration and large area of potential effect (see table 4-26).

Ethnographic Resources. Alternative 4 would have a moderate effect on the ethnographic resources in Glacier Bay. The effects of alternative 4 on ethnographic resources in Glacier Bay would be less than those of alternative 1 due to longer restricted entry season, slower vessel speeds, and additional restricted waters. Alternative 4 also restricts cruise ships and tour vessels from and limits charter vessel entries for Dundas Bay, thus reducing potential effects on ethnographic resources. Alternative 4 would not affect the integrity and association of the eligible or potentially eligible ethnographic resources or their eligibility for the national register. Thus, the effects of alternative 4 on ethnographic resources would be moderate (see table 4-26).

Cultural Landscape. Alternative 4 would have a moderate effect on the cultural landscapes in Glacier Bay because the Huna Tlingit have maintained their connection to the Bartlett Cove cultural landscape. Alternative 4 would have less of an effect on the Bartlett Cove cultural landscape than alternative 1. The park has documented a cultural landscape in Dundas Bay that contains the archaeological remains of two Huna Tlingit villages with accompanying oral history and other cultural resources (e.g., cemetery, house pilings, smokehouse debris, and fragments of a dugout canoe), stone cairns (believed to be Tlingit shrines), traditional berry-picking areas (one Native name for the area translates as “Berry Land”), and was known historically as a place for harvesting seals and salmon. Alternative 4 would result in a moderate effect on the Dundas Bay cultural landscape because of proposed limited vessel activity. The effects of alternative 4 would not affect these cultural landscapes’ eligibility for the national register, and thus would have a moderate effect on cultural landscapes in the park.

Cumulative Effects on Cultural Resources – Alternative 4. The cumulative effects of the actions external to this plan (e.g. increased tourism, tourists who go ashore, restricted access to the park, and subsistence limitations) would not significantly alter the effects on the cultural resources of Glacier Bay and Dundas Bay; therefore, the cumulative effect would be moderate.

Impairment Analysis for Cultural Resources – Alternative 4. Although the duration would be long-term and the timing of the effect is a period of Huna Tlingit use of the park (May through September), the overall severity of effect of alternative 4 would be moderate. Thus, no impairment would occur to these resources under alternative 4.

Potential Mitigation Measures for Cultural Resources – Alternative 4. The effect on ethnographic resources and the cultural landscape could be mitigated by the formation of a task force comprising of the Hoonah Indian Association and NPS officials. This task force would identify potential adverse effects in the park and design a cooperative management plan to address them.

Conclusion, Cultural Resources – Alternative 4. The potential effects of alternative 4 would be negligible for eligible or potentially eligible archaeological and historic structural resources, and minor for eligible or potentially eligible ethnographic resources (e.g., traditional cultural properties) and cultural landscapes. The contribution of cumulative effects from other actions would be minor. The overall effect to cultural resources would be minor, and no impairment would occur.

Alternative 5 – Effects on Cultural Resources. Alternative 5 maintains seasonal vessel entry quotas at current levels but extends the season for cruise ships and modifies vessel operating requirements for all vessels (e.g., vessel speeds, whale water boundaries, and vessel operations). For Dundas Bay, alternative 5 proposes 276 seasonal-use days and no daily vessel quota for charter vessels, allows one tour vessel into lower Dundas Bay per day, and restricts cruise ships and tour vessels from entering wilderness waters.

Direct and Indirect Effects on Cultural Resources – Alternative 5.

Archaeological and Historic Structural Resources. Alternative 5 would have a negligible effect on archaeological resources in Glacier and Dundas Bays through erosion or contamination. Alternative 5 has the potential to affect nine coastal archaeological sites in Glacier Bay, 15 coastal archaeological sites in Dundas Bay, and four historic structural resources in Dundas Bay through vessel-induced wakes and contamination caused by possible fuel spills. Alternative 5 would cause a negligible effect to these resources even though the implementation of this alternative would result in erosion that is slightly greater that current levels, but there would be no perceptible change to the coastline (see subsection 4.4.6). As with the other alternatives, because the known archaeological and historic structural resources within Glacier and Dundas Bays are located above the wake zone, there would be a negligible effect from vessel wakes and oil discharge or fuel spills. The effect of alternative 5 on archaeological resources and historic structural resources would have no effect on national register eligibility for archaeological sites in Glacier and Dundas Bays. Thus, alternative 5 would have a negligible effect on known archaeological resources despite the long duration and large area of potential effect (see table 4-26).

Ethnographic Resources. Alternative 5 could potentially affect eight traditional cultural properties in Glacier and Dundas Bays. Alternative 5 proposes maintenance of current vessel entries with a longer restricted entry season for cruise ships (May through September), decreasing potential perceived effects. The addition of vessel restrictions (e.g., no cruise ships or tour vessels in wilderness waters) may have beneficial effects for the relationship between the Huna Tlingit and the park by reducing potential effects. Alternative 5 would not affect the potential eligibility of the ethnographic resources / traditional cultural properties for the national register because the Huna Tlingit have maintained their cultural connection to the ethnographic resources. Thus, alternative 5 would have a moderate effect on ethnographic resources in Glacier and Dundas Bays.

Cultural Landscape. Alternative 5 could potentially affect two cultural landscapes, Bartlett Cove and Dundas Bay, and would have a moderate effect on cultural landscapes in Glacier and Dundas Bays because cultural landscapes are an extension of ethnographic resources. Alternative 5 may affect the integrity and association of eligible or potentially eligible cultural landscapes in Glacier and Dundas Bays, but would not affect these cultural landscapes' eligibility for the national register because the Huna Tlingit have maintained their cultural connection to the cultural landscape. Thus, alternative 5 would have a moderate effect on the Glacier Bay cultural landscape.

Cumulative Effects on Cultural Resources – Alternative 5. Alternative 5 would have a similar cumulative effect as alternative 1, although the cumulative effect would be less due to the proposed decrease in vessel traffic/quotas in Dundas Bay and more stringent operating requirements. It is unlikely the cumulative effects would affect the eligibility of ethnographic resources and cultural landscapes so long as the Huna Tlingit desire to maintain their connection/relationship with culturally significant places in Glacier and Dundas Bays.

Impairment Analysis for Cultural Resources – Alternative 5. Although the duration is long, the overall severity of alternative 5 would be negligible for archaeological and historic structural resources. For ethnographic resources and cultural landscapes, the severity of the effect would be moderate, the duration would be long-term, the timing of the effect would be May through September (a period of Huna Tlingit use of the park), the effect would include the Huna Tlingit perception of degradation of connection to the ethnographic resource and cultural landscape, and the cumulative effect of alternative 5 would be moderate. Because the overall severity of alternative 5 would be moderate, this alternative would not result in impairment on cultural resources in the park.

Potential Mitigation Measures for Cultural Resources – Alternative 5. The effect on ethnographic resources / traditional cultural properties and the cultural landscape could be mitigated by the formation of a task force (Huna Tlingit and NPS officials) that would address potential adverse effects to ethnographic resources and cultural landscapes in the park. This task force would also design a cooperative management plan to address adverse effects.

Conclusion, Cultural Resources – Alternative 5. The potential effects of alternative 5 would be negligible for eligible or potentially eligible archaeological and historic structural resources, but moderate for eligible or potentially eligible ethnographic resources (e.g., traditional cultural properties) and cultural landscapes. The overall effect of alternative 5 on cultural resources would be moderate. The cumulative effects of alternative 5 would be moderate. Alternative 5 would not result in impairment of cultural resources in Glacier and Dundas Bays.

Summary, Cultural Resources. The effect of the implementation of the alternatives on cultural resources ranges from negligible to moderate. Cumulative effects could contribute additional moderate direct or indirect effects, ranging from minor to moderate. Mitigation measures could include the formation of a Huna Tlingit and NPS task force. This task force would identify potential adverse effects in the park and design a cooperative management plan to address them. Implementation of the alternatives would not impair the park's cultural resources.

4.4.2 VISITOR EXPERIENCE

4.4.2 Visitor Experience

This section evaluates the potential effects of implementing the proposed alternatives on visitor experience. The regulatory framework is presented first, followed by the effects analysis for each alternative. This discussion also includes an evaluation of cumulative effect on visitor experience. Conclusions summarize the results of each evaluation.

Issues of Concern Raised during Scoping. The issues related to visitor experience that were identified during scoping are:

- the presence of large cruise ships could diminish the experience of visitors from smaller vessels due to the visual effects and loss of wilderness experience.
- vessel noise could intrude on visitor solitude in Glacier Bay.
- the presence of vessels may provide a backcountry user with a greater sense of security knowing that help is nearby if an emergency occurs.
- the presence of vessels may scare wildlife and thereby could diminish the visitor experience of those expecting to see wildlife.

Regulatory Framework. Managing how the public uses the parks is one of the fundamental missions of the Park Service. The importance of visitor experience is addressed under NPS policies (NPS 2001b) and essentially all other planning documents related to the park, including the park's general management plan (NPS 1984). The Organic Act of 1916, which created the Park Service and its mission, also mandates the Park Service to provide for the public's enjoyment of the parks.

Methodology and Assumptions. This evaluation of the alternatives' effects on visitor experience focuses on the quality of visitor experience and the opportunities for visitors to visit Glacier Bay. Visitor opinions and overall impression of the park were determined based on two studies, one conducted in 1989 (Johnson 1990) and another in 1999 (Littlejohn 2000). The 1989 study, *Glacier Bay National Park Tour Boat Passenger Visitor Survey,* measured the effect of vessel sightings on the experience of tour vessel passengers while viewing Grand Pacific Glacier. While more than 10 years old and limited to tour vessel passengers only, the study provides qualitative information that was used to judge the motorized vessel visitor's current experience and how the alternatives would affect visitor experience. The 1999 study, *Bartlett Cove Visitor Study,* provides the results of 545 questionnaires distributed to visitors at Bartlett Cove. The Alaska Travel Industry Association's *Images of Alaska 2000* (GMA Research Corporation 2001) and earlier editions provide data regarding the importance of visiting national parks while in Alaska

among past and prospective visitors. *The Backcountry Distribution and Use Report* (Kralovec 2001) also provides some information about visitor reactions to seeing motorized vessels and aircraft.

To provide additional information regarding visitor experience for this EIS, the EIS team interviewed cruise line marketing and customer relations managers, tour vessel operators, and charter operators. These interviews provide qualitative data regarding the perceived relationship between the volume of vessel traffic in the Bay and the quality of visitors' Glacier Bay experience.

The EIS study team used professional judgment to characterize the level of effects of the alternatives on visitor experience for the following types of visitors: cruise ship passengers, charter and other tour vessel passengers, private vessel users, and backcountry (non-motorized) users. This evaluation compares the existing visitor experience with the experience that would likely occur under each alternative and rates the changes as negligible, minor, moderate, or major. Visitor experiences, particularly for backcountry visitors, and the degree to which they experience intrusion from motorized vessels and aircraft, may vary by the geographical area within Glacier Bay or Dundas Bay. The threshold criteria identified here are used to refer to the Bays as whole entities, not to particular regions within each Bay. Estimating the potential effects by different regions within each Bay is beyond the scope of this analysis. Based on the two perspectives related to visitor experience (quality and opportunity), the intensities of effects on visitor experience are described in table 4-27.

TABLE 4-27: THRESHOLD CRITERIA FOR VISITOR EXPERIENCE EFFECTS ANALYSIS

Negligible	The effect on visitor experience would be barely detectable and would affect few visitors. Visitors would experience the same level of satisfaction with the Glacier Bay experience, and the same level of opportunity to visit the Bay as with the no-action alternative (1).
Minor	The effect would be minor if there were a detectable, but slight, decline in the quality of the experience for visitors traveling in the Bay or in the opportunity for visitors to experience the Bay (defined as reduction in capacity of less than 10% among all vessel categories combined).
Moderate	Moderate effects would include a readily apparent decline in the quality of the visitor experience or a clear reduction in the opportunity for visitors to experience the Bay (defined as a 10% to 20% reduction in capacity).
Major	Severe, obvious decline in the quality of the visitor experience or severe reduction in the opportunity for visitors to experience the Bay (defined as a 20% or more reduction in capacity) would be major effects.

Alternative 1 (No Action) – Effects on Visitor Experience.

Direct and Indirect Effects on Visitor Experience – Alternative 1. Overall, existing management provides a wide range of opportunities for park visitors. Some visitor conflicts occur, including the diminished experience for some individuals upon seeing cruise ships and other vessels.

Quality of Experience. The diminished experience is a result of not only the presence of the ship itself but also the associated noise, air pollution, and disturbance to wildlife. Non-motorized wilderness provides opportunities to experience the park without the presence of motorized vessels. Alternative 1 would have negligible short-term effects on opportunities to visit Glacier Bay. Under current vessel management requirements, the effects of other vessels on the experience of tour vessel passengers would continue to be minor. Based on the low number of negative comments reported in the 1989 NPS survey of tour vessel passengers, the sighting of other vessels is unlikely to detract from the enjoyment of park resources by this visitor group (Johnson 1990). In fact, an almost equal number of respondents said that the sighting of other vessels added to their enjoyment. Conclusions from this study are supported by the results of a 1999 park visitors survey that found that among private, charter, and tour vessel passengers collectively, 76% reported no adverse effect on their experience from sightings of cruise ships and 92% reported no adverse effects from sightings of other vessels (Littlejohn 2000). The same survey found that vessel sightings at glaciers did not bother 86% of private, charter, and tour vessel passengers; therefore, under alternative 1, a minor segment of tour vessel passengers would be either adversely or positively affected by the sighting of other vessels.

Similarly, the effects of other vessel sightings among cruise ship passengers are likely to be minor. Although no survey data regarding this visitor group exist, they are similar to tour vessel passengers in that they experience Glacier Bay with a large number of other people. Their experience does not hinge on an atmosphere of individual solitude and isolation; however, cruise ship visitors still find it important to experience some level of solitude and quiet in Glacier Bay. Cruise ship captains try to communicate with other cruise ships so that two ships are not at any tidewater glacier at the same time. There is likely a minority of cruise passengers who, like tour passengers, would report a positive or negative effect on their experience from the sighting of other vessels. In the overall visitor population, however, this effect would continue to be minor.

Visitors experiencing Glacier Bay and/or Dundas Bay on charter vessels are likely to continue to experience the presence of other vessels in the Bay. The negative impression of other vessels might be

somewhat greater than for visitors on cruise ships or tour vessels because, as small-vessel travelers, their experience is more likely to be dependent on an atmosphere of undisturbed wilderness. The sights and sounds of other vessels, especially large cruise ships, are likely to detract from the wilderness experience for some visitors. Charter use in Dundas Bay is expected to increase over time under alternative 1. This increase would likely have minor to moderate adverse effects on the quality of charter visitors' experience in Glacier Bay, as wildlife sightings could be less frequent because charter vessel traffic may displace certain species.

Private vessel visitors are similar to charter vessel visitors in that they are seeking a more solitary wilderness experience. Some of these visitors would likely continue to be disturbed by the current level of vessel activity in the park.

For backcountry users (non-motorized), an overall moderate level effect would occur due to the presence of cruise ships and other vessels. A two-cruise-ship-per-day limit with seasonal limits would be imposed. Because of the seasonal limit, there potentially could be days without cruise ships. By viewing the cruise ship itinerary ahead of time, backcountry users could plan trips around the cruise ship schedule and experience the Bay without the sights, sounds, and smells of cruise ships. Also under this alternative, motorized use of wilderness waterways would be seasonally restricted, except for the upper end of Dundas Bay and the Beardslee Entrance, to allow for increased opportunities to experience the Bay in the absence of motorized vessels. Alternative 1 also provides alternating seasonal closures for Wachusset and Muir Inlets, allowing opportunities for non-motorized wilderness recreation.

Backcountry visitors travel throughout all areas of the park, with concentration near the shorelines, visiting major attractions, experiencing natural features, and viewing wildlife. Motorized vessels, particularly charter and private vessels, may anchor for 12 hours or more near wilderness and are visible from some campsites. Such anchorages would continue in alternative 1, and it is likely that their distribution and number would continue at current patterns and levels.

Watercraft can diminish the experience of backcountry visitors. Visitor use surveys conducted in 1979 and 1984 indicated that 55% and 60% of backcountry users, respectively, experienced disturbance from motorized watercraft (Johnson 1979; Salvi and Johnson 1985). In the 1984 study, 25% of the respondents — the largest single percentage — suggested limiting watercraft when asked for recommendations for new regulations. More than 63% of the respondents stated that the number of watercraft and aircraft sighted resulted in a strong or great contribution to their perception of being crowded. In 1979 and 1984,

approximately 88% of respondents preferred to see no increase in cruise ships, 90% preferred to see no increase in tour vessels, and a substantial majority preferred to see no increase in other motorized vessel categories.

Opportunity. Currently, about half of the people who visit Alaska via cruise ships visit Glacier Bay. Under alternative 1, the current number of cruise ships would be maintained. If the Alaska cruise market continues its growth, a smaller percentage of the market would have the opportunity to visit the park. Because passenger capacity of cruise ships is increasing, however, the number of passengers traveling to the Bay would increase somewhat before leveling off. As an example of the effect of increasing capacity, the number of cruise ship passengers hit an all-time high in Glacier Bay in 2002, despite six cancellations and the lowest number of cruise ships visiting since 1996 (Parish 2002). New cruise ship capacity is as high as 2,600 passengers.

Use during May and September could also increase, resulting in an overall increase in visitation to the Bay. According to cruise line executives, the Glacier Bay experience is in very high demand among cruise passengers; this demand is likely to continue to be greater than the level of opportunity. Overall, alternative 1 would be expected to have minor to moderate adverse effects on future visitors' opportunity, to the extent that it would constrain future opportunity to visit the Bay via cruise ship and continue to leave demand for opportunities to visit the Bay unsatisfied. In addition, alternative 1 could lower the proportion of Alaska's visitors having the opportunity to experience Glacier Bay, and further, could shift visitor-related environmental effects (mainly cruise-related) to alternative destinations, such as Tracy Arm in Southeast Alaska, Hubbard Glacier near Yakutat, and Prince William Sound in Southcentral Alaska.

Alternative 1 would continue to offer 276 entries per season to tour vessels. In recent years, the number of actual tour vessel entries was substantially less than the number allowed (200 in 2002, 228 in 2001, and 224 in 2000). In the small cruise ship market, most itineraries include Glacier Bay, making it widely available to these visitors. If the small-ship cruise market increases, there would likely be room for those additional entries. The primary day tour vessel, the *Spirit of Adventure*, meets the current level of demand (with daily departures throughout the summer, the vessel rarely runs at capacity); therefore, under alternative1, sufficient opportunity for day vessel passengers to experience the park would continue.

Alternative 1 would offer 312 entries per season to charter vessels. In general, this limit would continue to meet charter vessel demand. From June through August 2001, there were 172 charter vessel entries (out of the allowable 312) and 247 total use days (out of the allowable 552). Alternative 1 would, in the

absence of other concession management changes, perpetuate the perceived shortage of permits for Elfin Cove, Hoonah, and other local charter operators who wish to have entry permits, but do not at this time. This is particularly true for charter vessel operators wishing to use Dundas Bay. Alternative 1 perpetuates this perceived shortage because charter vessel permit quotas would not be changed from the current situation.

Among visitors who experience the park in private vessels, alternative 1 would continue to offer 468 total entries from June through August. Over the last several years, the limit has provided some opportunity for this market — 414 private vessels entered the park in the 2000 season, followed by 385 in 2001. In addition to the seasonal limit, there are also daily limits. Alternative 1 would provide for three entries per day from June 1 to June 10, six entries per day from June 11 to August 2, five entries per day from August 3 to August 15, and three entries per day from August 15 to August 31. This may continue to result in periods when the daily demand for park entry exceeds the number of allowable entries.

For backcountry visitors, particularly those sensitive to seeing motorized vessels, the presence of vessels could reduce opportunities to engage in experiences that rely on a sense of wildness, remoteness, quiet, and solitude.

Vessels, although intermittent during the day, would continue to be visible to backcountry visitors almost every day from May to September. This could lead some visitors either to choose not to engage in a backcountry visit or to choose restricted, non-motorized waters, thus increasing use levels and congestion there. Exposure to noise, sights, and smells of motorized vessels diminishes opportunities for solitude among backcountry visitors. The recurrent nature of this disturbance to backcountry visitors is considered a moderate effect.

Cumulative Effects on Visitor Experience – Alternative 1. Alaska's visitor industry is expected to increase. Cruise ship traffic is expected to increase more rapidly than independent visitor traffic. This would increase demand for opportunities to visit Glacier Bay. More locally, development of a new visitor's center in Glacier Bay, development of a private cruise ship port in Hoonah, and growth in the number of people wishing to visit Glacier Bay could result in increasing demand to visit Glacier Bay by cruise ship, tour vessel, charter vessel, or private vessel. This increasing demand could exacerbate the existing imbalance between the desire to visit Glacier Bay while on a cruise ship and the available opportunities to see the Bay aboard a cruise ship. Eventually, these same factors could increase the demand to visit the Bay aboard tour vessels, charter vessels, and private vessels to levels above those

possible under alternative 1. Other than this long-term consideration, the cumulative effect on quality of visitor experience and visitor opportunities associated with alternative 1 would be minor.

Impairment Analysis for Visitor Experience – Alternative 1. Visitor experience is not a resource subject to impairment evaluation.

Potential Mitigation Measures for Visitor Experience – Alternative 1. Scheduling of cruise vessels to arrive at the upper end of Glacier Bay at about the same time would reduce negative effects for backcountry and small-vessel visitors.

Conclusion, Visitor Experience – Alternative 1. Under alternative 1, visitors using motorized vessels would continue to be provided with a wide range of park-related opportunities. Backcountry visitors would continue to experience a loss of opportunity to experience solitude, resulting in a moderate effect. Alternative 1 would have negligible short-term effects on opportunities to visit the Bay. Vessel quotas set forth in alternative 1 could lower the proportion of Alaska's visitors having the opportunity to experience Glacier Bay, and further, could shift visitor-related environmental effects (primarily cruise-related) to alternative destinations, such as Tracy Arm in Southeast Alaska, Hubbard Glacier near Yakutat, and Prince William Sound in Southcentral Alaska.

Alternative 2 – Effects on Visitor Experience.

Direct and Indirect Effects on Visitor Experience – Alternative 2.

Quality of Experience. Among tour vessel passengers, alternative 2 would have negligible effects on the quality of visitors' experience. This finding is based on data from the 1989 and 1999 NPS surveys of motorized vessel passengers on the effects of vessel traffic and sightings on visitors' experience. The majority of respondents said that such sightings were irrelevant to the level of their enjoyment. For a small group of visitors, the sighting of a cruise ship or a pleasure vessel would detract from their enjoyment. Conversely, a small percentage of respondents indicated that the sighting of other vessels would be enjoyable.

Among cruise passengers, alternative 2 would have negligible effects on the quality of visitors' experience. Although no survey data exist regarding the effects of vessel sightings on cruise ship passengers' experience, it can be assumed that the survey data quoted above would correspond closely

with cruise passengers' attitudes. Both cruise ship and tour vessel visitors are experiencing Glacier Bay aboard vessels with a large number of other people. Their experience is not dependent on a feeling of isolation from the civilized, developed world. While the sighting of other vessels represents moderate beneficial or detrimental effects for a minority of passengers, overall, the lesser amount of vessels proposed in alternative 2 would have negligible effects on the quality of cruise passengers' experience.

Among charter vessel visitors, alternative 2 represents a minor beneficial effect. There is no survey data regarding this market; however, charter vessel passengers generally visit Glacier Bay and Dundas Bay on smaller vessels and tend to seek a more remote, undisturbed experience when compared to the tour vessel or cruise passenger market. A reduction of 23% of cruise ship entries would likely improve the experience for these visitors.

Among private vessel visitors, alternative 2 represents a minor beneficial effect. As in the case of charter vessel visitors, private vessel visitors tend to seek a remote wilderness experience. The sight and sound of a large cruise ship represent an infringement upon this solitary experience. It can be assumed that a moderate proportion of private vessel visitors would have a more enjoyable experience with fewer cruise ship entries. A reduction of 23% in cruise ship entries would be beneficial to the overall private vessel visitor market.

Under the current management scheme, backcountry visitors enjoy seasonal closures to motorized travel in seasonally closed non-motorized waterways, including the Beardslee Islands (except the Beardslee Entrance), the Hugh Miller / Scidmore complex, Adams Inlet, Wachusset Inlet, Rendu Inlet, Muir Inlet (north of McBride Glacier), and Johns Hopkins Inlet. Cruise ships and tour, charter, and private vessels could travel through all other areas of the park. Motorized travel would be allowed throughout Dundas Bay, including the wilderness waters of Dundas Bay. Backcountry visitors would travel throughout all areas of the park with concentration near the shorelines, visiting major attractions, experiencing natural features, and viewing wildlife.

Opportunity. Among cruise passengers, alternative 2 would decrease the opportunity to the park, with 23% fewer seasonal entries by cruise ships allowed. This would represent a major adverse effect on the opportunity for cruise passengers to visit the park.

Because the number of tour vessel entries into Glacier Bay would remain the same in alternative 2 as in alternative 1, there would be a negligible effect on the opportunity for tour vessel passengers to visit the park.

Alternative 2 would create a moderate adverse effect on the opportunity for charter vessel visitors to visit the park, because it would decrease the allowable entries (compared to alternative 1) by 13%.

Among private vessel visitors, alternative 2 would create a moderate adverse effect on the opportunity to visit the park. The allowable entries would decrease by 13% from alternative 1.

Backcountry users would enjoy increased opportunities to experience solitude under this alternative due to the 23% decrease in cruise ship use days, 7% decrease in charter vessel use days, and a 13% decrease in private vessel use days. As mentioned in alternative 1, approximately 88% of respondents to backcountry surveys (Johnson 1979; Salvi and Johnson 1985) preferred to see no increase in cruise ships, 90% preferred to see no increase in tour vessels, and a substantial majority preferred to see no increase in other motorized vessel categories. With seasonal limits, there would potentially be days without cruise ships. By viewing the cruise ship itinerary, backcountry users could plan their schedule and experience the Bay without cruise ships. The potential effects of anchorages on visitor experiences would be slightly reduced from alternative 1.

Opportunities to engage in experiences that rely on a sense of wildness, remoteness, quiet, and solitude are slightly increased under this alternative because of the decrease in use days for two of the categories of large motorized vessels, and the decrease in private vessel use days. Because backcountry visitors place such a high value on opportunities to experience solitude in the backcountry, and this alternative provides a slight increase in those opportunities, it is anticipated that this alternative would improve the quality of their backcountry experience. This effect would last the life of this plan and would occur in a wilderness backcountry setting that is relatively rare in the National Wilderness Preservation System. Because this alternative would produce some intrusion into the ability of backcountry visitors to achieve their desired experience, and it is recurrent, this effect is considered minor.

Cumulative Effects on Visitor Experience – Alternative 2. Other than the indirect effects associated with increasing demand for opportunities to visit Glacier Bay while the number of actual opportunities is declining (as described under the cumulative effects of alternative 1 subsection), all cumulative

considerations would result in negligible changes in the quality of visitors' experience in Glacier Bay, or the opportunity to visit Glacier Bay aboard motorized vessels.

Impairment Analysis for Visitor Experience – Alternative 2. Visitor experience is not a resource subject to impairment evaluation.

Potential Mitigation Measures for Visitor Experience – Alternative 2. Loss of opportunities to visit the park is an effect of reducing cruise ship numbers and cannot be avoided. (Note that as cruise ships become larger and carry more passengers, the loss of opportunities can be somewhat offset, but this is not considered a mitigation measure.)

Conclusion, Visitor Experience – Alternative 2. In summary, alternative 2 would improve the experience for backcountry visitors and visitors traveling aboard motorized vessels with the reduced presence of cruise ships. The 23% reduction in cruise ship entries would result in a loss of opportunity for cruise ship passengers, which would be a major effect.

Alternative 3 – Effects on Visitor Experience. Alternative 3 would continue the current vessel quotas, management activities, and operating restrictions, but would allow for potential future increases in vessel traffic up to the quotas authorized in the 1996 vessel management plan, depending on results of environmental studies. Cruise ship entries would still be restricted to a maximum of two per day, but the total number of allowable entries for the season could increase from 139 to 184 (which would be two cruise ships per day, every day of the season). For the purposes of this analysis, the maximum seasonal-use day level is assumed. All other vessel quotas would remain the same as in alternative 1. Alternative 3 does not propose any changes in the management or vessel entries in Dundas Bay.

Direct and Indirect Effects on Visitor Experience– Alternative 3.

Quality of Experience. Among tour vessel passengers, alternative 3 would have negligible effects on the quality of visitors' experience. This finding is based on data from the 1989 and 1999 NPS studies, as described under alternative 1. The 1999 survey (Littlejohn 2000) included private and charter vessel visitors, but produced generally the same findings as the 1989 study.

The effects of alternative 3 on cruise passengers' experience would be similar to those on tour vessel passengers. Both visitor groups are experiencing Glacier Bay aboard vessels with a large number of other

people. Their experience is not completely dependent on a feeling of isolation from the civilized, developed world. While there may be a small minority of passengers who expect to find a sense of isolation and solitude from their cruise ship, overall the greater amount of cruise vessels proposed in alternative 3 would have negligible effects on the quality of cruise passengers' experience.

Among charter vessel visitors, alternative 3 represents a minor adverse effect. Charter vessel passengers generally visit Glacier Bay on smaller vessels and tend to be seeking a more remote, undisturbed experience when compared to the tour vessel or cruise passenger market. An increase of 32% in the number of cruise ships would likely detract from the quality of experience, including wildlife sightings, for some charter vessel visitors. Most charter vessel visitors would notice little difference when compared to alternative 1, because the number of cruise ships allowed per day would remain at two. However, there would be fewer days and potentially no days, during the visitation season when no cruise ships would be present in the Bay.

For private vessel visitors, alternative 3 represents a minor adverse effect. As in the case of charter vessel visitors, private vessel visitors tend to be seeking a remote wilderness experience. An increase of 32% in the number of cruise ships would detract from the quality of the experience for some private vessel visitors.

Because this alternative includes provisions for additional increases in cruise ships and because cruise ships have a greater effect on backcountry visitors' experience of solitude, the effects on backcountry visitor's ability to experience solitude would be greater for this alternative than alternative 1. The increased number of cruise ships may lead to more backcountry visitors seeking non-motorized wilderness, leading to loss of solitude in those areas. The potential effects of anchorages on visitor experiences would be similar to alternative 1. This effect would last the life of this plan and occurs in a wilderness setting that is relatively rare in the National Wilderness Preservation System. Because of the recurrent nature of this disturbance and the potential loss of opportunities to experience the backcountry with no cruise ships present, the effects on backcountry visitors would be considered major.

Opportunity. Among cruise passengers, alternative 3 represents a major beneficial effect on the opportunity to experience the park. This alternative would allow for 32% more cruise ship entries, and thus a substantial increase in the opportunity to visit the park on a cruise ship.

Because the number of tour, charter, and private vessel entries into Glacier Bay would remain the same in alternative 3 as in alternative 1, there would be a negligible effect on the opportunity for these passengers to visit the park.

Opportunities to experience wilderness waters without motorized boats would be the same as those in alternative 1.

Cumulative Effects on Visitor Experience – Alternative 3. All cumulative considerations under alternative 3 would result in negligible changes in the quality of visitors' experience in Glacier Bay, or the opportunity to visit Glacier Bay aboard motorized vessels. Opportunities to experience wilderness waters without motorized boats would be the same as in alternative 1.

Impairment Analysis for Visitor Experience – Alternative 3. Visitor experience is not a resource subject to impairment evaluation.

Potential Mitigation Measures for Visitor Experience – Alternative 3. Scheduling of cruise vessels to arrive at the upper end of Glacier Bay at about the same time would reduce the negative effects for backcountry and smaller vessel visitors.

Conclusion, Visitor Experience – Alternative 3. Among motorized vessel passengers, alternative 3 would lower the quality of the visitor experience with the increase in cruise ships, resulting in minor adverse effects. For backcountry visitors, this effect would be major. In terms of visitor opportunity, there would be an increased opportunity for cruise ship passengers to visit Glacier Bay, which would be a major beneficial effect.

Alternative 4 – Effects on Visitor Experience. Under alternative 4, the quota season would be extended to include May and September. Seasonal entry quotas for cruise ships would decrease to 92 (June through August). Tour vessels would be limited to two vessels per day, a reduction from the three-per-day limit under alternative 1. June through August, tour vessel seasonal-use days would be reduced from 276 to 184. Charter vessel entries would be reduced from six to five per day, with seasonal-use days reduced from 552 to 460 in Glacier Bay. Daily entries for private vessels would be reduced from 25 to 22, though seasonal-use days would increase from 1,971 to 2,024. Vessel operating requirements would be modified for vessel speeds, whale water boundaries, and vessel operations. Tour vessels would no longer be allowed to enter Dundas Bay under alternative 4.

Direct and Indirect Effects on Visitor Experience – Alternative 4.

Quality of Experience. Among tour vessel passengers, alternative 4 would have minor effects on the quality of visitors' experience. This finding is based on data from the 1989 and 1999 NPS surveys of motorized vessel passengers on the effects of vessel traffic on visitors' experience.

The effects of alternative 4 on cruise passengers' experience would be similar to those on tour vessel passengers. While there may be a small minority of passengers for whom the sighting of other vessels improves or detracts from their experience, overall, the decrease in cruise vessels would have negligible effects on the quality of cruise passengers' experience.

Among both charter vessel and private vessel passengers, alternative 4 would result in moderate beneficial effects. As stated previously, these visitors tend to be seeking a more remote, undisturbed experience when compared to the tour vessel or cruise passenger market. The sight and sound of a large cruise ship represents an infringement upon this solitary experience. A decrease of 34% in the number of cruise ships would likely enhance the quality of experience for some of these visitors. In addition, alternative 4 would prohibit any tour vessels allowed into Dundas Bay and the East Arm of Glacier Bay, which would further improve the experience, including wildlife sightings, for these passengers.

Backcountry non-motorized visitors could visit most areas of the park on some days without the presence of cruise ships. Sea kayakers dropped off near Muir Point could travel throughout the Bays and inlets in the East Arm away from the sights and sounds of most large motorized vessels (including cruise ships and tour vessels, not charter vessels). Overall, the daily number of motorized vessels of all classes would be lowered under this alternative from the current situation (see alternative 1, no action).

Under alternative 4, backcountry visitors would be able to plan a trip outside of the sights, sounds, and smells of cruise ships. The itinerary for cruise ships would be available to them prior to their trip and half of the days in the summer season could potentially be free of cruise ships. Also, exact cruise ship routes would be known to visitors allowing them to plan trips in places and times when cruise ships are not present. This alternative also closes Dundas Bay to both cruise ships and tour vessels (although cruise ships currently choose not to enter Dundas Bay) allowing for more solitude from the sights and sounds of large motorized vessels (private motorized boats can still visit Dundas Bay wilderness waters, however).

Opportunity. Regarding opportunities for cruise ship passengers to experience Glacier Bay, alternative 4 would have a major adverse effect with the 34% decrease in allowable cruise ship seasonal use days. Alternative 4 also would have a major adverse effect on tour vessel passengers' opportunities to visit Glacier Bay with a 33% decrease in allowable tour vessel entries. The effect to charter vessel passengers would be moderate because of a 17% decrease in charter vessel seasonal use days. Because private vessel seasonal use days into Glacier Bay would increase slightly in alternative 4 compared to alternative 1, there would be a negligible effect on the opportunity for these passengers to visit the park.

The opportunity to visit Dundas Bay and the East Arm of Glacier Bay would be reduced under alternative 4. While private vessels would continue to be allowed entry into these areas, tour vessels would be prohibited, creating a major adverse effect on these passengers' opportunities to visit the area. Charter vessels also would be more restricted than in alternative 1 — limited to three vessels per day in Dundas Bay. This restriction, coupled with loss of opportunities to take a tour vessel to Dundas Bay or the East Arm, would create a moderate adverse effect on tour and charter vessel visitors' opportunities.

For backcountry visitors, this alternative would provide increased opportunities to experience solitude, particularly for those visitors who do the proper planning and are aware of the cruise ships schedule; therefore, it is anticipated that this alternative would increase the likelihood of a positive experience for non-motorized backcountry visitors. This effect would last the life of this plan and occur in a wilderness backcountry setting that is relatively rare in the National Wilderness Preservation System. Because the reduction of motorized craft and the closure of the East Arm to some vessel classes increase opportunities to experience solitude and wildness, the anticipated effects would be moderately positive.

Cumulative Effects on Visitor Experience – Alternative 4. All cumulative considerations under alternative 4 would result in negligible changes in the quality of visitors' experience in Glacier Bay, or the opportunity to visit Glacier Bay aboard motorized vessels, in addition to those stemming from alternative 4 alone.

Impairment Analysis for Visitor Experience – Alternative 4. Visitor experience is not a resource subject to impairment evaluation.

Potential Mitigation Measures for Visitor Experience – Alternative 4. The loss of opportunities to visit the park associated with reducing cruise ship numbers cannot be avoided.

Conclusion, Visitor Experience – Alternative 4. Alternative 4 would reduce the numbers of all vessel classes except private vessels, which would be beneficial to the quality of visitor experience. In terms of visitor opportunity, however, there would be major adverse effects for cruise ship and tour vessel passengers, moderate effects on opportunities for charter vessel passengers, and negligible effects on private vessel visitor travel in the Bay.

Alternative 5 – Effects on Visitor Experience. Under alternative 5, cruise ship entries would remain at 139 from June through August and would be limited to 92 days in May and September. (Under current regulations, up to 62 cruise ships can enter the Bay each May and each September, although this limit has never been attained). This alternative also includes additional vessel operating requirements on speed restrictions and location of whale waters. In Dundas Bay, one tour vessel per day would be allowed in the lower Bay only; charter vessels would not have a daily limit, but would be allowed 459 total use days, and private vessels would have unlimited entries.

Direct and Indirect Effects on Visitor Experience – Alternative 5.

Quality of Experience. The effects of alternative 5 on passengers of both cruise ships and tour vessels would be negligible. It can be assumed that the quality of the cruise and tour passenger experience is unlikely to be affected by the fewer cruise ships proposed in alternative 5 because, as described for other alternatives, their experience is largely independent of the presence of other vessels.

Alternative 5 would represent minor beneficial effects for both charter vessel and private vessel passengers. While the fewer number of cruise ships would improve the wilderness experience for a minority of these visitors, the decrease is 25%, and would occur only in May and September, when fewer charter vessels and private vessels are visiting the park. Although a small percentage of charter vessels and private vessels would benefit from decreased vessel disturbance and increased isolation, the effects on the overall experience would be minor.

For Dundas Bay under alternative 5, cruise ships would not be permitted. This would not affect visitor experience because currently cruise ships do not enter Dundas Bay because of the navigational hazards there. Tour vessels would only be allowed in non-wilderness waters in the lower portion of the Bay and would be limited by daily vessel quotas and seasonal use days (June 1 through August 31). Charter vessels would be limited by seasonal use days, June 1 through August 31, although there would be no

daily vessel quota. There would be no limit for private vessels. Compared with alternative 1, alternative 5 would have a beneficial effect on the quality of experience for private vessel passengers.

There would be no limits on private vessel use in any portions of Dundas Bay. Backcountry non-motorized visitors would be free to visit any and all areas of the park except those areas closed because of sensitive bird or seal habitat or problem bears. The effects to non-motorized backcountry visitor experience under this alternative would be the similar as those listed for alternative 1, with two exceptions. First, setting a limit of six on charter vessels in Dundas Bay during the period of June 1 to August 31 could increase the opportunities for solitude that many backcountry visitors seek by decreasing the total numbers of larger motorized vessels and the associated sounds, smells, and sightings of them, if current use levels are lower than six per day. This alternative would potentially slightly increase the adverse effects of anchorages on backcountry visitor experiences. Also, if these charter vessels discharge sea kayakers to Dundas Bay, limiting the numbers of these charter vessels could decrease the total numbers of sea kayakers in the Bay, as well. Due to a lack of monitoring, however, it is unclear what type of activities charter vessels currently are bringing to Dundas Bay; therefore, it is impossible to gauge the effect this change would have over alternative 1. Second, because of the 17% increase in private vessel seasonal-use days under this alternative, opportunities to experience Glacier Bay free from the intrusions of motorized vessel sounds, smells, and sights are further decreased from alternative 1.

Opportunity. Alternative 5 would have a moderate adverse effect on the opportunity for cruise visitors to experience Glacier Bay. Total allowable cruise entries for May through September would decrease 11%, from 261 in alternative 1 to 231.

Alternative 5 introduces no changes in the number of entries for tour vessels, charter vessels, and private vessels when compared to alternative 1 (the seasonal use day limit for private vessels would be greater); therefore, it would represent negligible effects on the opportunity for passengers aboard these vessels to experience Glacier Bay.

Alternative 5 represents a minor beneficial effect on the opportunity to experience Dundas Bay for charter vessel passengers, because it provides for unlimited daily entries for this vessel type; however, the seasonal-use days (276) would be imposed. This alternative represents a minor detrimental effect on the opportunity among tour vessel passengers, because it limits their entries to one per day, and prohibits them from the upper Bay. The opportunity for private vessel passengers to experience Dundas Bay would be unchanged under alternative 5.

Exposure to noise, sights, and smells of motorized vessels diminishes opportunities for solitude among backcountry visitors. This effect would last the life of this plan and occurs in a wilderness backcountry setting that is relatively rare in the National Wilderness Preservation System. The recurrent nature of this disturbance to backcountry visitors is considered a moderate effect.

Cumulative Effects on Visitor Experience – Alternative 5. Cumulative considerations under alternative 5 would result in negligible changes in the quality of visitors' experience in Glacier Bay, or the opportunity to visit Glacier Bay aboard motorized vessels.

Impairment Analysis for Visitor Experience – Alternative 5. Visitor experience is not a resource subject to impairment evaluation.

Potential Mitigation Measures for Visitor Experience – Alternative 5. Although effects would be minor, coordination among the cruise lines so that vessels arrive at the upper end of Glacier Bay at about the same time would reduce the effects to backcountry and smaller vessel visitors.

Conclusion, Visitor Experience – Alternative 5. Under alternative 5, cruise ship passengers and tour vessel passengers would continue to see other vessels, but the effect to the quality of visitor experience would be negligible. Among visitors on charter and private vessels, the reduction in cruise ships would have a minor beneficial effect. In terms of visitor opportunity, alternative 5 would lower the opportunity for cruise visitors to experience Glacier Bay, which would be considered a moderate effect. There would be negligible effects on opportunity for tour vessel, charter vessel, and private vessel visitor opportunities in Glacier Bay.

Summary, Visitor Experience. Visitor experience would change among the alternatives in three primary ways. First, since more than 85% of visitors to Glacier Bay experience the park on a cruise ship, changes in the numbers of cruise ships allowed would greatly affect opportunities for the most common method of viewing the Bay. Opportunities vary from a low of 92 cruise ship entries from June through August in alternative 4 to a high of 184 entries under alternative 3. Reducing cruise ship numbers to 92 is considered a moderate effect, because opportunities to visit Glacier Bay would be reduced by more than one-third.

Second, providing opportunity in the form of cruise ship entry also removes opportunities and reduces the quality of visits for people who wish to experience the Bay without cruise ships. Under all alternatives, non-motorized areas provide opportunities to experience the Bay without cruise ships, but reducing cruise ship numbers increases this opportunity throughout the Bay. Backcountry experiences would be enhanced for charter and private vessel users, non-motorized vessel users, and hikers, under alternative 4 by closing the East Arm of Glacier Bay to cruise ships and tour vessels. The loss of opportunity for tour vessel visitors is considered a moderate level effect.

Third, alternative 4 increases opportunities for solitude and quiet in Dundas Bay by closing it to tour vessels and limiting charter use to three vessels per day. Alternative 5 provides more opportunities for charter vessels to use Dundas Bay by providing flexibility to allow an unlimited number of charters on any particular day, with a seasonal-use day limit of 276. The loss of opportunity to tour vessels is considered a moderate level effect.

4.4.3 Vessel Use and Safety

4.4.3 Vessel Use and Safety

This subsection evaluates the probable effects of implementing the alternatives on vessel use and safety in Glacier Bay and Dundas Bay.

Issues of Concern Raised during Scoping. The issues related to vessel use and safety that were identified during scoping include:

- Increasing vessels or vessel speed could increase the risk of vessel-vessel and vessel-marine mammal collisions.
- The 10-knot vessel speed restriction could decrease maneuverability of large vessels, causing an increased risk to visitor safety.
- The 10-knot speed limit in whale waters should be retained and a 14-knot vessel speed restriction should be instituted in non-whale waters to protect whales transiting throughout the park.
- Smaller vessels are more maneuverable than larger vessels and should be allowed to travel at faster speeds because they could avoid most potential hazards.
- Waves generated from larger vessels could swamp kayaks or small vessels on the water. Additionally, these waves could swamp landed kayaks and small vessels. All vessels are vulnerable in ice-filled waters. Protocols should be developed to limit the possibility of accidents and reduce the possible incidence of oil spills in ice-filled waters.
- Increasing fines for noncompliance of regulations, for example excess emissions, could decrease the incidence of regulations violations and increase safety throughout the park.
- Increasing the user friendliness of the operating requirements could increase the possibility that vessel operators would adhere to the rules and decrease the possibility of accidents.
- Cruise and tour vessels should have strict protocols and routes to minimize the risk of vessel groundings that could cause resource damage or risks to visitor safety.

Regulatory Framework.

Marine Safety Regulations. The following is a discussion of marine safety regulations applicable to most vessels operating in the park. These regulations serve to ensure that vessels operate with appropriate safety standards to provide for the protection of the passengers, other vessels, and the environment.

All vessels operating offshore, including those operating under foreign registrations, are subject to the requirements that are applicable to vessel construction, condition, and operation. The U.S. Coast Guard conducts compliance inspections of vessels to verify that foreign-flagged vessels operating in U.S. waters comply with applicable international conventions, and with all United States laws and regulations (required under Title 46 of the United States Code). The purpose of these inspections is to establish that

the vessel is properly built and equipped and that the crew possesses adequate knowledge and training to operate the vessel safely.

When vessels do not comply with applicable laws or regulations, the U.S. Coast Guard imposes controls to bring them into compliance. The U.S. Coast Guard's responsibility is to identify and eliminate substandard ships from U.S. waters. In general, a vessel is substandard if the hull, machinery, or equipment, including that related to lifesaving, firefighting, and pollution prevention, is below the standards required by U.S. laws or international conventions.

The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) regulates pollution and spills from ships. MARPOL 73/78 contains measures to prevent accidental and operational causes of marine pollution. Regulations covering design, equipment, operations, and survey requirements for the prevention of pollution are provided in five annexes to the convention. These annexes include regulations for prevention of pollution by oil (1983), regulations for the control of pollution by noxious liquid substances (1987), and regulations for the prevention of pollution by garbage (1988). Fuel and other spills from vessels are described in detail in the water quality section (see subsection 3.2.4)

The International Convention on Standards of Training, Certification and Watchkeeping (STCW 78) sets forth training, certification, and qualification requirements for shipboard personnel. It establishes basic principles to be observed in keeping navigational and engineering watches, and specifies minimum knowledge required for certification of the crew. STCW 78 was completely amended and revised in 1995. The training required under this convention includes oil spill prevention and countermeasures. This series of regulations is consistent and in many cases more stringent than U.S. guidelines. U.S. Coast Guard reviews the ship's compliance with these international agreements during compliance inspections.

The Convention on the International Regulations for Preventing Collisions at Sea, 1972, sets forth the basic "rules of the road," such as rights-of-way, safe speed, action to avoid collision, and procedures to observe in narrow channels and restricted visibility. The convention also details the technical parameters of navigation lights, shapes, and sound signals.

Special vessel construction standards are established in regard to watertight integrity and carriage of dangerous articles and substances aboard foreign vessels. These regulations are set forth in 46 USC 2101(12) and 3306(a)(5), and 49 USC 1801-1812. In addition, the load line requirements for foreign

vessels pertaining to the maximum draft permitted for safe operating conditions are set forth in 46 USC 5101-5116 and in the International Convention on Load Lines, 1966. All of these regulations are intended to require ships to operate with adequate equipment and under safe conditions.

Park Boating Safety Regulations. Park boating regulations limit the number of vessels that can be in the park at any one time through vessel quotas. In addition, there are the following speed restrictions:

- From May 15 through August 31 in the waters of the lower Bay motor vessel are restricted to a speed through the water of no more than 20 knots or no more than 10 knots when the superintendent has designated a maximum speed of 10 knots (due to the presence of whales); and
- From July 1 through August 31, motor vessels are restricted to a speed through the water of 10 knots in Johns Hopkins Inlet south of an imaginary line running due west from Jaw Point.

Implementation of the vessel quotas and speed restrictions serve to supplement the USCG and MARPOL safety regulations to minimize the potential for collisions and groundings.

Methodology and Assumptions. The evaluation of the potential effects on vessel use and safety focused on many of the issues raised during public scoping. The analysis of the effects of implementing the alternatives on the overall safety of vessels, vessel traffic, and the risks of major vessel accidents is based on vessel traffic and safety data and known factors related to vessel incidents. Vessel traffic and safety data were obtained through interviews with park staff and vessel operators and park incident records related to vessel accidents. Park records are assumed to contain all major incidents since major incidents are easily detectable and normally involve radio transmissions from the vessels involved. For this analysis, any vessel collision, grounding, or other vessel incident that results in the death or serious injury of individuals on board the vessel, or the subsequent discharge of at least 25 gallons of fuel oil into the water is classified as a “major” incident. Minor incidents are assumed to be underreported in the more remote areas of Glacier and Dundas Bays, but overall records are assumed to form a good representation of overall vessel incidents.

A fire or explosion could result in the loss of life and/or severe damage to the vessel. A fire or explosion could cause the release of hazard materials to the sea or air. A risk of a marine fire, or explosion, while present, is low because the types of activities that commonly contribute to marine fire and explosion do not occur. The fuel used for the marine vessels is diesel, which is a fire hazard when exposed to standard temperature and pressure conditions; however, diesel fuel is considered a combustible substance, rather

than flammable, according to U.S. Department of Transportation (DOT) regulations. The Department of Transportation defines flammable liquids as those with a flash point below 37.8 degrees Celsius (°C; 100° Fahrenheit [F]) and combustible liquids as those with a flash point between 37.8 degrees Celsius (100°F) and 75.5 degrees Celsius (200°F).

For each effects analysis, use was assumed to be at the maximum level of use allowed during seasons when limits are in place. Factors related to traffic patterns were based on tracking records and known vessel use patterns, as illustrated in chapter 3. The vessel safety analysis was based on known factors related to vessel incidents, considered collectively with the specific operating conditions in place and proposed for the particular alternative being evaluated.

This analysis assumes that each vessel present in the park represents an extremely small but measurable risk of being involved in a major accident. As a result, greater numbers of vessels necessarily result in a corresponding increase in the overall risk of major accidents. Depending upon circumstances, however, it is possible for the overall risk of major accidents to remain low or extremely low despite incremental increases in the number of vessels allowed within Glacier Bay; however, small boat capsizings are a concern because large vessel wakes are often generated well after the originating vessel has passed through an area, and they are often unanticipated.

The potential exists for waves generated by larger vessels to swamp kayaks or small boats on the water or landed on the beach; however, based on the wake analysis report conducted as part of this EIS (see appendix G), the low vessel speeds in the Bay generate wakes that are generally small in comparison to naturally occurring waves in Dundas Bay and/or Glacier Bay.

Determinations regarding the overall significance of effects were based on the effects thresholds listed in table 4-28.

TABLE 4-28: THRESHOLD CRITERIA FOR THE VESSEL USE AND SAFETY EFFECTS ANALYSIS

Negligible	The risk of vessel accidents leading to serious injury, death, or fuel oil spills over 25 gallons would be extremely low.
Minor	The risk of vessel accidents leading to serious injury, death, or fuel oil spills over 25 gallons would be low.
Moderate	A slightly elevated risk of vessel accidents leading to serious injury, death, or fuel oil spills over 25 gallons would exist.

TABLE 4-28: THRESHOLD CRITERIA FOR THE VESSEL USE AND SAFETY EFFECTS ANALYSIS

Major	A significantly elevated risk of vessel accidents leading to serious injury, death, or fuel oil spills over 25 gallons would exist.

Alternative 1 (No Action) - Effects on Vessel Use and Safety.

Direct and Indirect Effects on Vessel Use and Safety – Alternative 1. Effects of the implementation of alternative 1 potentially could alter the overall safety of vessels, vessel traffic, and the risks of major vessel accidents.

Overall Vessel Safety and Vessel Traffic. Since the vessel management plan was implemented in 1996, no cruise ships have been involved in collisions or groundings; however, there were two onboard fires. One fire was in a trashcan, while the other involved inhalation injuries. A commercial crab-fishing vessel, fishing in the winter, sank, and one tour vessel has grounded. In a separate incident, another tour vessel struck an iceberg in Tarr Inlet and suffered hull damage. There was no fuel spill associated with this incident. Twenty-one other vessels (mostly private vessels) have grounded, but with only minor damage reported. Other types of accidents commonly reported include vessels going adrift or dragging anchor and minor collisions. Table 4-29 lists 58 vessel incidents recorded by the Park Service between 1994 and 2001.

TABLE 4-29: SUMMARY OF VESSEL-RELATED INCIDENTS AT GLACIER BAY, 1994-2001

Date	Incident	Description	Location
15-Feb-94	Vessel Accident	fishing vessel sinks during crab season – fuel spill	Strawberry Island
25-May-94	Vessel Grounding	private vessel grounds – damage and diesel spill	Bartlett River
30-May-94	Vessel Adrift	private vessel runs out of fuel – no damage	North Passage
28-Jun-94	Vessel Accident	NPS vessel strikes rock – damage	Beardslee Islands
26-Jul-94	Vessel Grounding	charter vessel scrapes rock – no damage	Geikie Inlet
11-Aug-94	Vessel Grounding	inflatable tender grounds – no damage	Bartlett Cove
01-Sep-94	Vessel Grounding	charter vessel scrapes rock – no damage	Fingers Bay
18-May-95	Vessel Grounding	private vessel drags anchor at low tide – no damage	Bartlett Cove
05-Jun-95	Vessel Adrift	private dinghy anchored in closed area drags anchor	Bartlett Cove
11-Jun-95	Vessel Fire	tour vessel suffers smoke damage from electrical short in engine	Bartlett Cove
13-Jun-95	Vessel Grounding	private vessel grounds, then refloats – no damage	Bartlett Cove
04-Jul-95	Vessel Adrift	private vessel has engine problems – towed in by NPS	Young Island
04-Jul-95	Vessel Fire	private vessel fire in engine compartment – engine damage	Lower Bay
13-Jul-95	Vessel Grounding	anchored charter vessel grounds and refloats	Gloomy Knob
16-Jul-95	Vessel Grounding	fishing vessel runs aground and refloats – hull damage	Pt. Carolus
20-Jul-95	Vessel Grounding	private sailboat runs aground and refloats – no damage	Blue Mouse Cove
26-Jul-95	Vessel Adrift	anchored charter vessel drags anchor – no damage	Bartlett Cove
20-Aug-95	Vessel Accident	dinghy capsizes and dumps operator – no injuries/damage	Bartlett Cove
06-Jul-96	Vessel Grounding	private vessel grounds then refloats – no damage	Bartlett River Cut
26-Aug-96	Vessel Accident	tourboat strikes iceberg and suffers hull damage	Tarr Inlet
24-Jun-97	Vessel Adrift	private vessel w/engine problems towed in by NPS	Reid Inlet
23-Jul-97	Vessel Adrift	research skiff w/engine problems towed in by NPS	Garforth Island
28-Aug-97	Vessel Adrift	charter vessel drags anchor/strikes vessel – minor damage	Bartlett Cove

TABLE 4-29: SUMMARY OF VESSEL-RELATED INCIDENTS AT GLACIER BAY, 1994-2001

Date	Incident	Description	Location
15-Feb-98	Vessel Grounding	fishing vessel strikes reef – minor fuel spill	Beardslee Islands
20-May-98	Vessel Accident	anchored private vessel drags anchor – minor damage	Bartlett Cove
26-May-98	Vessel Grounding	private vessel strikes rock – minor damage	North Fingers Bay
08-Jun-98	Vessel Grounding	private sailboat grounds while docking – no damage	Bartlett Cove
15-Jun-98	Vessel Adrift	research vessel out of gas gets NPS tow	Strawberry Island
15-Jun-98	Vessel Grounding	private vessel strikes rock – minor damage	South Fingers Bay
12-Aug-98	Vessel Accident	tourboat wraps buoy line around prop – minor damage	Bartlett Cove
12-Jun-99	Vessel Aground	tourboat strikes rock, remains grounded – minor fuel spill	Dundas Bay
08-Jul-99	Vessel Adrift	anchored skiff drags anchor, striking vessel – minor damage	Bartlett Cove
17-Jul-99	Vessel Adrift	private vessel w/stuck rudder gets tow by tourboat	Lone Island
17-Sep-99	Vessel Adrift	anchored private vessel drags anchor – no damage	Bartlett Cove
23-May-00	Vessel Fire	cruiseship suffers fire onboard – damage and inhalation injuries	Tarr Inlet
04-Jun-00	Vessel Adrift	private vessel w/engine problems gets tow to dock by NPS	Lester Island
04-Jun-00	Vessel Grounding	tourboat strikes sandbar – no damage	Reid Inlet
13-Jun-00	Vessel Fire	cruiseship reports trashcan fire on board – minor damage	Tarr Inlet
05-Jul-00	Vessel Grounding	private vessel runs aground – minor damage	N. Fingers Bay
14-Jul-00	Vessel Adrift	private sailboat w/engine problems gets towed in by NPS	Bartlett Cove
17-Jul-00	Vessel Adrift	NPS vessel runs out of gas	Ripple Cove
03-Aug-00	Vessel Grounding	private vessel grounds on rocks – minor damage	Hugh Miller Rocks
14-Aug-00	Vessel Accident	private vessels collide while anchoring – minor damage	Bartlett Cove
07-Sep-00	Vessel Adrift	anchored private vessel drags anchor – no damage	Bartlett Cove
16-Sep-00	Vessel Accident	anchored NPS skiff capsizes – no damage	Tidal Inlet
25-Sep-00	Vessel Grounding	private vessel strikes reef – minor damage	Berg Bay
11-Mar-01	Vessel Grounding	private vessel breaks docklines and drifts – major salvage	Bartlett Cove
16-May-01	Vessel Blackout	cruiseship Regal Princess suffers brief power outage	Up Bay
01-Jun-01	Vessel Adrift	anchored private boat drags anchor – no damage	Bartlett Cove
07-Jun-01	Vessel Grounding	private vessel strikes submerged reef – minor damage	Fingers Bay
23-Jun-01	Vessel Adrift	anchored private boat drags anchor – no damage	Bartlett Cove
06-Jul-01	Vessel Adrift	anchored tugboat drags anchor/ snags hydrophone cable	Bartlett Cove
15-Jul-01	Vessel Adrift	anchored private boats repeatedly contact/minor damage	Bartlett Cove
21-Jul-01	Vessel Grounding	private vessel strikes rock on floodtide – no damage	Muir Pt.
24-Jul-01	Vessel Accident	anchored private boats repeatedly contact/minor damage	Bartlett Cove
10-Aug-01	Vessel Accident	door damage to docked private vessel from water wake	Bartlett Cove
07-Sep-01	Vessel Adrift	anchored oil spill response barges drag anchor/no damage	Bartlett Cove
07-Sep-01	Vessel Adrift	anchored private vessel drags anchor – no damage	Bartlett Cove

Based on an analysis of vessel accidents in the park between 1994 and 2001, cruise ships, tour vessels, charter vessels, and private vessels have a good safety record for operations in Glacier Bay. The U.S. Coast Guard has concluded that traveling on a cruise ship from a U.S. port is the safest form of transportation available (USCG 1995). Additionally, this report found that there appears to be no evidence of trends or heightened risks associated with oceangoing cruise ships from U.S. ports. Clearly, cruise ship operations are not without risks. In 1994, a crew member from a cruise ship drowned after falling into the water during a personnel transfer operation involving an NPS interpreter. A cruise ship fire in Tarr Inlet in May 2000 resulted in damage to the vessel, as well as smoke inhalation injuries. An analysis of the available vessel accident data suggests that experiencing Glacier Bay and Dundas Bay from a vessel is a safe activity under current vessel quotas and operating restrictions. Given the low incidence of injury, the effect of implementation of alternative 1 on overall vessel safety would be negligible.

Current controls on vessel entry strictly limit the density of vessels in Glacier Bay. Excluding commercial fishing vessels and administrative vessels, the density of vessels in Glacier Bay at full capacity is estimated to be one vessel for every 12.3 square miles (31.9 square kilometers) of water. Although this calculation assumes a uniform distribution of vessels, it illustrates the relatively low density of vessels within Glacier Bay. The areas of Glacier Bay most likely to experience higher densities are:

- the inlets containing tidewater glaciers at Tarr Inlet and Johns Hopkins Inlet in the West Arm.
- Bartlett Cove in the vicinity of Park Headquarters.

Because most administrative and support functions associated with vessel activity in Glacier Bay occur at Bartlett Cove, vessels tend to congregate in this area. Vessel accident data shows a concentration of minor vessel incidents in the Bartlett Cove, but not Tarr Inlet. The congestion in these locations has not translated into major vessel incidents; therefore, under alternative 1, the effect of vessel traffic would be negligible.

Risk of Major Vessel Accidents. The International Regulations for Preventing Collisions at Sea, 1972 (72 COLREGS) seek to reduce the risk of collision. The 72 COLREGS apply to all of the waters within the park (see 33 CFR 80.1705). Professional and recreational vessel operators are required to understand and comply with the 72 COLREGS; however, as with the risk of fire and explosion, the risk of collision is present. The risk of collisions is increased with additional marine traffic, navigational hazards, or severe weather conditions. These risks are reduced through the use of navigational aids and weather restrictions.

Of the 58 vessel incidents recorded by the Park Service between 1994 and 2001, 25 occurred in Bartlett Cove (see accident data in table 4-29). The majority of these incidents involved vessels dragging anchor or otherwise operating at slow speed with minor or no damage. The large number of vessel incidents in Bartlett Cove is understandable given the operating patterns of vessels within Glacier Bay. Bartlett Cove is the center of vessel operations within Glacier Bay. Most charter vessels depart from this location and private vessels are required to check in with NPS officials at the Bartlett Cove Visitor Center to obtain a permit before operating in other areas of Glacier Bay. Tour vessels, including the daily tour vessel *Spirit of Adventure,* also pick up and discharge passengers at the Bartlett Cove Public Use Dock, further contributing to vessel congestion. There is no requirement for cruise ships to enter Bartlett Cove and, historically, they have not done so. Higher vessel densities also occur at the popular tidewater glaciers at Tarr Inlet and Johns Hopkins Inlet. Despite the higher concentrations of vessels, few major accidents were reported in these areas between 1994 and 2001.

Vessel speed limits would remain the same as in existing regulations and the park compendium (see appendix B). For vessels with traditional propellers and rudders, it can be difficult to maintain control when the vessel is proceeding with the current unless adequate speed through the water is maintained. A 10-knot speed limit through the water generally provides sufficient steerageway to maintain control of these vessels. The park superintendent may impose a speed limit of 10 knots in lower Glacier Bay whale waters due to the presence of whales. The success of these whale water speed restrictions is examined in greater detail in the discussion on marine mammals (see subsection 4.3.2). There were no reports of high-speed collisions between vessels in Glacier Bay or Dundas Bay between 1994 and 2001.

The accident data from 1994 through 2001 does not show any significant collisions between vessels underway in Glacier Bay or Dundas Bay. Vessel groundings were more common during this period with a total of 22. Two tour vessels have grounded on rocks in Glacier Bay and Dundas Bay. The *Wilderness Adventurer* grounded in Dundas Bay during 1999. An estimated 25 to 30 gallons of mixed lubrication oil and diesel leaked from the vessel. The *Yorktown Clipper* grounded in 1993; the ship released an estimated 50 gallons of diesel into Glacier Bay.

Table 4-30 lists the vessels that entered Glacier Bay in 1999, their sizes, draft, number of visits, and maximum number of gallons of fuel stored onboard.

TABLE 4-30: PHYSICAL VESSEL STATISTICS FOR 1999 GLACIER BAY ENTRIES

Vessel type	Size Range[a]	Draft (feet)	Annual Visits	Maximum Fuel Onboard (gallons)[b]
Cruise Ship (19 ships operated by 10 companies)	4,500- 109,000 GT, 295-951 feet	20-28	217	405,000 – IFO
Small Passenger Vessel (13 vessels operated by 5 companies)	18-120 GT, 25-219 feet	6-15	297	12,000 - diesel
Fuel Barge	Approximately 250 feet	13 (loaded)	12 (Bartlett Cove)	1.5 million (2 x 750,000) – non-persistent oil
Commercial Fishing Vessel	20-50 feet	4-8	By permit	Less than 4,000 – diesel

TABLE 4-30: PHYSICAL VESSEL STATISTICS FOR 1999 GLACIER BAY ENTRIES

Vessel type	Size Range[a]	Draft (feet)	Annual Visits	Maximum Fuel Onboard (gallons)[b]

_____
Source: Eley 2000.

a. Size ranges based on 2002 entries
b. A spill of this maximum amount would essentially require total break-up of the vessel and/or fuel tank.

GT = gross tons.
IFO = intermediate fuel oil.

Based on park incident records, less than one powered grounding in five results in any fuel being spilled. No cruise ship collisions or groundings were reported during the 1994–2001 period. No major fuel spills during this period caused by collisions and groundings occurred.

A concern expressed by the public was the possibility of a fuel spill in ice-filled water near the glaciers. In 1996, a tour vessel struck an iceberg and suffered hull damage but no fuel spill occurred. According to NPS personnel, no spills are known to have occurred in ice-filled waters (NPS, Nemeth, pers. com., unknown date). Even with the most current spill clean up technology, clean up of a fuel spill in ice-filled waters would be difficult. The water quality section of this chapter concludes that a fuel release in ice-filled waters constitutes a potential major effect due to the lack of effective clean up technology and the direct effect of spilled fuel on water quality and wildlife resources. A recent report concluded, however, that the probability of a fuel spill as a result of a collision with ice in Glacier Bay is low (Eley 2000). Eley (2000) reported the following observations of marine pilots who regularly operate in Glacier Bay:

- the southern-most boundary for ice in Glacier Bay during the cruise ship season is Composite Island.
- north of Composite Island, cruise ships travel at maneuvering speed of less than 8 knots during daylight.
- ice not pushed away from the hull by Lattimer flow makes only incidental contact with the cruise ship.

While no fuel spills have occurred in ice-filled waters, the potential effects to water quality and wildlife resources is major. Although no major fuel spills have occurred in ice-filled waters in Glacier Bay, the possibility that such a spill could occur still exists. The probability of such a spill, however, is low; therefore, the effect of the implementation of alternative 1 on the risk of a major vessel accident is minor.

Implementing alternative 1 would have negligible effects on vessel safety and vessel traffic, but the risk of a major vessel accident is minor due to the remote possibility of a fuel spill in ice-filled waters; therefore, the overall direct and indirect effect would be expected to be minor.

Cumulative Effects on Vessel Use and Safety – Alternative 1. Activities other than those proposed in this plan could affect vessel safety, specifically the presence of commercial fishing and administrative vessels in the park. Commercial fishing is currently occurring in the park, but will decrease over time. The above analysis of effects already accounts for the presence of commercial fishing and administrative vessels since they have been operating in the park during the period analyzed; therefore, the contribution of this activity is already addressed and would not provide additional effects.

Impairment Analysis for Vessel Use and Safety – Alternative 1. Vessel safety is not a park resource and, therefore, cannot be impaired.

Potential Mitigation Measures for Vessel Use and Safety – Alternative 1. None required.

Conclusion, Vessel Use and Safety – Alternative 1. The direct and indirect adverse effects of implementing alternative 1 would be minor. The cumulative effects of other activities would not alter this effect. Impairment is not applicable to this topic and mitigation is not necessary. The overall effect of implementing alternative 1 on vessel traffic and safety would be minor.

Alternative 2 - Effects on Vessel Use and Safety. Alternative 2 reduces vessel quotas to the 1985 levels, reducing cruise ship seasonal entries and seasonal use days to 107 from the current total of 139. Alternative 2 reduces seasonal entries for charter vessels by slightly more than 13% while seasonal use days are reduced by a little more than 2%. Seasonal use days for private vessels likewise decline slightly more than 13% to 1,714. No changes would occur for vessel use in Dundas Bay.

Direct and Indirect Effects on Vessel Use and Safety – Alternative 2. The overall direct and indirect effects of alternative 2 on vessel traffic and safety would be very similar to that described for alternative 1, but are not identical.

Overall Vessel Safety and Vessel Traffic. Alternative 2 would result in incremental improvements in vessel safety and slight reductions in overall vessel traffic over alternative 1. There would be days when overall vessel traffic would be equivalent to current levels, but there would be more days when the

maximum daily quota would not be reached because of seasonal entry and seasonal use day restrictions. With fewer cruise ships entering Glacier Bay and the reduction in the number of charter vessel and private vessel seasonal entries and seasonal use days, vessel traffic would be reduced. Alternative 2 would expose Glacier Bay to fewer overall vessel entries. These reductions would result in a marginal improvement in vessel safety; therefore, the effect would be negligible. No changes would occur in Dundas Bay.

Risk of Major Vessel Accidents. Relative to alternative 1, implementing alternative 2 would result in a marginal decrease in the risk of cruise ship-related accidents because cruise ships would be present on fewer days. There would be a corresponding marginal reduction in the overall risk of fuel spills from cruise ships because 23% fewer cruise ship visits to Glacier Bay would occur. There would be no change in Dundas Bay. The reductions in vessel traffic in Glacier Bay would decrease the risks of collisions, groundings, and fuel spills from alternative 1, and the effect of implementation of this alternative would be negligible.

The direct and indirect effects of implementation of alternative 2 would have negligible effects on vessel safety, vessel traffic, and the risk of a major vessel accident due to the reduction of vessel traffic; therefore, the overall direct and indirect effects would be expected to be negligible.

Cumulative Effects on Vessel Use and Safety – Alternative 2. The presence of administrative vessels and activities such as commercial fishing could affect vessel safety and traffic. As discussed in alternative 1, these effects are accounted for in the above analysis and would not contribute to any additional direct effects; therefore, the contribution of this activity is already addressed and would not provide additional effects.

Impairment Analysis for Vessel Use and Safety – Alternative 2. Vessel safety is not a park resource and, therefore, cannot be impaired.

Potential Mitigation Measures for Vessel Use and Safety – Alternative 2. None required.

Conclusion, Vessel Use and Safety – Alternative 2. Implementation of alternative 2 would have negligible direct and indirect adverse effects on vessel traffic and safety. The cumulative effects of other activities would not alter this effect. Impairment is not applicable to this topic and mitigation is not necessary. The overall effect of implementing alternative 2 on vessel traffic and safety is negligible.

Alternative 3 - Effects on Vessel Use and Safety.

Direct and Indirect Effects on Vessel Use and Safety – Alternative 3. Alternative 3 has the potential to increase cruise ship traffic from 139 to as much as 184 over the 92-day, June-through-August, visitor season.

Overall Vessel Safety and Vessel Traffic. The overall direct and indirect effects of alternative 3 on vessel traffic and safety are expected to be very similar to those discussed for alternative 1. Alternative 3 would increase vessel traffic because more cruise ships would enter Glacier Bay; however, no changes would occur in Dundas Bay. Vessel traffic and congestion would be identical to current "high-use" days when two cruise ships call on Glacier Bay. The cruise ship industry attempts to stagger the entry of cruise ships into Glacier Bay, which has served to reduce congestion caused by two cruise ships attempting to visit the same area simultaneously. Overall, cruise ship operations from U.S. ports are very safe. The effects of implementing alternative 3 on vessel traffic and safety are expected to be negligible.

Risk of Major Vessel Accident. There would be a marginal increase in the risk of cruise ship related accidents because there would be more cruise ships calling on Glacier Bay each season. There would also be an increase in the overall risk of fuel spills from cruise ships because there would be 45 additional cruise ship entries each season. The overall risk of vessel accidents and fuel spills would remain extremely low under alternative 3. Current vessel operating requirements (mandatory use of pilots, staggered cruise ship entry schedule) have successfully reduced the risk of accidents involving cruise ships. There have been no collisions, groundings, or fuel spills from cruise ships in Glacier Bay; however, there is a low probability of a fuel spill in ice-filled waters. The effects of implementing alternative 3 on major vessel accidents would be similar to alternative 1; therefore the effect would be minor.

The direct and indirect adverse effects on vessel safety and vessel traffic of implementing of alternative 3 would be negligible, but the risk of a major vessel accident would be minor due to the low probability of a fuel spill in ice-filled waters; therefore, the overall effect would be expected to be minor.

Cumulative Effects on Vessel Use and Safety – Alternative 3. Activities such as commercial fishing and the presence of administrative vessels could affect vessel safety and traffic. As discussed in alternative 1, the effect of commercial fishing and administrative vessels is accounted for in the above analysis and would not contribute any additional direct effects.

Impairment Analysis for Vessel Use and Safety – Alternative 3. Vessel safety is not a park resource and, therefore, cannot be impaired.

Potential Mitigation Measures for Vessel Use and Safety – Alternative 3. None required.

Conclusion, Vessel Use and Safety – Alternative 3. The direct and indirect adverse effects of implementing alternative 3 would be minor. The cumulative effects of other activities would not alter this effect. Impairment is not applicable to this topic and mitigation is not necessary. The overall effect of implementing alternative 3 on vessel traffic and safety would be minor.

Alternative 4 - Effects on Vessel Use and Safety. Alternative 4 establishes a new system of vessel quotas that focuses on the total number of vessels within Glacier Bay rather than the total number of "daily entries." Alternative 4 expands the current June through August "season" for vessel quotas to include both May and September. It modifies current vessel operating requirements regarding vessel speeds, whale water locations, and vessel routes and destinations.

Alternative 4 reduces cruise ship quotas to an average of no more than one per day and East Arm north of Sebree Island and Beardslee Entrance would be closed to cruise ships. The daily vessel quota for cruise ships would remain two. Tour vessel quotas would be reduced from three to a maximum of two per day and would not be allowed in the East Arm of Glacier Bay north of Muir Point, Beardslee Entrance, Berg Bay, and Fingers Bay. Charter vessel quotas would decline from six per day to five. Private vessel quotas would decline from 25 to 22 per day. A separate daily quota of three charter vessels would be established for Dundas Bay from May through September under alternative 4. Cruise ships and tour vessels would be restricted from Dundas Bay. Private vessels would not be limited to Dundas Bay.

Direct and Indirect Effects on Vessel Use and Safety – Alternative 4.

Overall Vessel Safety and Vessel Traffic. Alternative 4 results in a proportional decrease in vessel traffic. Although the daily vessel quota for cruise ships would remain two, cruise ships entries into Glacier Bay would average no more than one per day between May and September, thus reducing the volume of traffic.

Restricting cruise ships and tour vessels from Dundas Bay could reduce congestion in this relatively small (37.2 square miles) body of water. In fact, cruise ships have not requested to enter Dundas Bay, although they are not prohibited under current vessel management regulations. Restricting tour vessels from Dundas Bay represents a change from current practice since tour vessels currently use this area. Under alternative 4, Dundas Bay would experience less vessel congestion due to the prohibition on cruise ships and tour vessels and restriction of charter vessels to a maximum of three.

Alternative 4 proposes significant changes to vessel speed limits. Vessel speed limits would apply from May 1 through September 30. Vessels under 80 meters in length would be limited to 20 knots (through the water) unless the superintendent had designated a 10 knot speed (through the water) due to the presence of whales. Vessels over 80 meters in length would be limited to less than 13 knots (through the water) unless the superintendent had designated a 10 knot speed (through the water) due to the presence of whales. The higher speed limits for smaller vessels results, in part, from the fact that these vessels are more maneuverable than larger vessels and can slow down or stop in a shorter distance to protect whales and other marine life. These speed limits, as measured through the water, are adequate to provide steerageway for vessels with traditional propellers and rudders proceeding with the water current.

It is an accepted fact of vessel operations that smaller vessels are more maneuverable than larger ones, all other things being equal. Generally smaller vessels can turn sharper and slow down faster than larger vessels. This increased maneuverability can help a smaller vessel avoid a hazard sighted in its path, whereas a larger vessel might not be able to avoid the same hazard under identical conditions. Although some larger vessels are built with specialized thrusters or rudders to improve their stopping and turning characteristics, as a general rule, smaller vessels are more maneuverable than larger ones.

Alternative 4 prohibits cruise ships from entering wilderness areas, but would allow them to enter the West Arm, Tarr Inlet, and Johns Hopkins Inlet up to Jaw Point. Cruise ships and tour vessels also would not be allowed into the East Arm (tour vessels would be allowed in the entrance waters of East Arm). Most importantly, for vessel traffic and safety is the fact that alternative 4 formally defines cruise ship routes (typically in mid-channel). A cruise ship route would be drawn using the current typical cruise ship traffic pattern. While this measure is being proposed for a number of different reasons, it results in a significant improvement in vessel safety. Formally defining cruise ship routes at or near mid-channel significantly reduces the risk that the ship will run aground and potentially cause a fuel spill. This measure also provides an increased margin of safety in the event the cruise ship temporarily loses power. A position in mid-channel provides the ship’s crew more time to restore power before the ship drifts

toward submerged hazards or the exposed shoreline. Formally designating the cruise ship route also would remove the temptation of a vessel master to bring the ship closer to shore (toward more hazardous waters) to provide passengers with a better view of wildlife or scenery. Formally designating cruise ship routes would represent a significant contribution to vessel safety in Glacier Bay, a beneficial effect.

The reductions in vessel entries in conjunction with the speed limits and cruise ship route designations will increase vessel safety and decrease vessel traffic, resulting in negligible effects.

Risks of Major Vessel Accidents. Reductions in the numbers of vessels visiting Glacier Bay would result in a marginal decrease in the overall risk of major vessel accidents corresponding in magnitude to the reduction in vessel use. Excess speed was not indicated as a primary cause in any of the major vessel incidents listed in the 1994 through 2001 Glacier Bay vessel accident data. Reducing vessels over 80 meters in length to a maximum speed of 13 knots while in whale waters (unless a 10-knot maximum speed has been designated by the park superintendent) is not expected to result in a measurable improvement in vessel safety. Formally designating cruise ship routes is, however, expected to contribute significantly to overall vessel safety by providing a larger margin of safety, especially with respect to groundings. Implementing alternative 4 would result in decreased vessel traffic, improved vessel traffic routing, and marginal improvements in vessel safety resulting in negligible effects, since decreased vessel traffic and speed limits would increase overall vessel safety.

The overall direct and indirect adverse effects of alternative 4 on vessel traffic and safety are expected to be negligible, but positive.

Cumulative Effects on Vessel Use and Safety – Alternative 4. The presence of administrative and commercial fishing vessels in the park could affect vessel safety. As discussed in alternative 1, the effect of the presence of these vessels is accounted for in the above analysis and would not contribute any additional direct effects.

Impairment Analysis for Vessel Use and Safety – Alternative 4. Vessel safety is not a park resource and, therefore, cannot be impaired.

Potential Mitigation Measures for Vessel Use and Safety – Alternative 4. None are required.

Conclusion, Vessel Use and Safety – Alternative 4. Implementation of alternative 4 would have positive direct and indirect effects on vessel traffic and safety, because the number of vessels in the Bay would be decreased and operating requirements would be established. The cumulative effects of other activities would not alter this effect. Impairment is not applicable to this topic and mitigation is not necessary; therefore, the overall effect of implementing alternative 4 on vessel traffic and safety would be positive.

Alternative 5 - Effects on Vessel Use and Safety. Daily vessel quotas under alternative 5 are set at current levels for cruise ships, tour vessels, charter vessels and private vessels with an extended season (May through September) for cruise ships. However, seasonal-use days for private vessels would increase from 1,971 to 2,300. For Dundas Bay, cruise ships would be prohibited. Tour vessels would be prohibited from entering wilderness waters, however, one tour vessel per day could enter the non-wilderness waters with a limit of 92 seasonal-use days. Charter vessels would have no daily vessel quota but 276 seasonal-use days. No limit would be placed on private vessels in Dundas Bay.

Direct and Indirect Effects on Vessel Use and Safety – Alternative 5.

Overall Vessel Safety and Vessel Traffic. Vessel operating requirements are similar for alternative 5 and alternative 4 with the exception of how vessel speed is determined. Alternative 5 prescribes that vessel speed will be measured "over the ground." This change will allow vessel operators to use installed GPS units to calculate vessel speed. Maximum whale water speed limits would be identical to alternative 4. The whale water season would extend from May 15 through September 30. Measuring vessel speed "over the ground" could be problematic for some vessels transiting through whale waters. In cases where a vessel is proceeding with the current (of up to 8 knots in some locations), a 10-knot speed over the ground may be insufficient to maintain adequate steerageway. Without adequate steerageway, a vessel may be extremely difficult to steer or the operator may totally lose control of the vessel. This represents a potential safety hazard for vessels proceeding down current but measuring vessel speed over the ground. In some cases, a vessel might be proceeding at only 2 knots through the water (10 knots over ground minus 8 knots of current). This proposed operational requirement may cause a significant impediment to vessel safety because it may be inadequate to maintain control, given existing current patterns. Alternative 5 also proposes to formally designate cruise ship routes. As discussed in alternative 4, formally designating cruise ship routes constitutes a significant safety enhancement.

Vessel entries into Dundas Bay are not separately regulated under the current Glacier Bay vessel management plan. Thus, the density of vessels in Dundas Bay under the current vessel management plan can theoretically be equal to or greater to that allowed under alternative 5.

Implementing alternative 5 is expected to produce a minor to moderate effect on vessel traffic and safety. This minor to moderate effect is driven almost entirely by the expected reduction in safety that would be caused by measuring vessel speed "over the ground" as opposed to "through the water." A 10-knot vessel speed over the ground may be inadequate for some vessels to maintain control while proceeding with a strong (up to 8 knots in some places) current.

Risk of Major Vessel Accident. Measuring vessel speeds "over the ground could increase the risk of major vessel accidents. Under alternative 5, the overall risk of major vessel accidents would be expected to increase incrementally over current conditions. Conversely, vessel accident rates and the risk of fuel spills are expected to be similar to those described for alternative 1 since daily vessel quotas are nearly identical. Designating formal cruise ship routes would be expected to result in a significant improvement in overall vessel safety and reduce the potential of large vessel collisions or groundings. The effects of implementing alternative 5 on major vessel accidents would be minor due to the low probability of an fuel spill in ice-filled waters.

In summary, the overall direct and indirect effects of alternative 5 on vessel traffic and safety are expected to be moderate due to the potential change in vessel safety resulting from a change how speed is measured.

Cumulative Effects on Vessel Use and Safety – Alternative 5. Commercial fishing and administrative vessels in the park could affect vessel safety. As discussed in alternative 1, the effect of commercial fishing is accounted for in the above analysis and would not contribute to any additional direct effects.

Impairment Analysis for Vessel Use and Safety – Alternative 5. Vessel safety is not a park resource and, therefore, cannot be impaired.

Potential Mitigation Measures for Vessel Use and Safety – Alternative 5. None are necessary.

Conclusion, Vessel Use and Safety – Alternative 5. Implementation of alternative 5 would have minor to moderate direct and indirect adverse effects on vessel traffic and safety. The cumulative effects of other

activities would not alter this effect. Impairment is not applicable to this topic. Mitigation is necessary. The overall effect of implementing alternative 5 on vessel traffic and safety would be minor to moderate.

Summary, Vessel Use and Safety. The effect of the implementation of the alternatives ranges from negligible to minor. Cumulative effects would not contribute additional direct or indirect effects. Impairment was not evaluated because vessel traffic and safety is not considered a park resource.

4.4.4 WILDERNESS RESOURCES

4.4.4 Wilderness Resources

This section evaluates the effects of each alternative on wilderness as a resource. The focus is on how the purposes, values, and characteristics of the wilderness contained within the park as defined in the Wilderness Act of 1964 and managed under the Alaska National Interest Lands Conservation Act (ANILCA) of 1980 would be affected by the proposed actions. Wilderness is a distinct park resource, separate from visitor experience, therefore, other aspects of visitor experience within the wilderness of Glacier Bay and Dundas Bay are evaluated in subsection 4.4.2, "Visitor Experience."

Issues of Concern Raised during Scoping. The primary issues of concern raised during public scoping with regard to wilderness resources include:

- An increase in vessel quotas could allow more people to experience a wilderness area intimately. In addition, wilderness would be more accessible.
- An increase in vessel quotas could diminish the value of wilderness by increasing the sense of crowdedness.
- The presence of large vessels could diminish the wilderness values.
- Increases in off-vessel activity could result in more trash and degradation of the terrestrial environment.

Regulatory Framework. The Wilderness Act of 1964 (Section 2c), the NPS Act of 1916 (Organic Act, Section 1), and the Alaska National Interest Lands Conservation Act (Section 101) call for providing recreational opportunities that emphasize viewing scenery or solitude, or that are primitive and unconfined. The concept of wilderness is defined in the Wilderness Act of 1964 (Public Law 88-577) as:

> *"an area of underdeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value."*

The 1916 Organic Act of the Park Service states that the purpose of the national parks is to "conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 USC 1).

Public lands in Alaska designated as wilderness under the provisions of the Alaska National Interest Lands Conservation Act (ANILCA) of 1980 differ from those designated outside of Alaska (see appendix I). Section 1110 of the act permits, " . . . the use of snow machines, motorboats, airplanes, and non-motorized surface methods for traditional activities . . . such use shall be subject to reasonable regulations by the Secretary to protect the natural and other values of the conservation system unit." This makes administration of wilderness in Alaska's national parks different than the administration in non-Alaskan national parks because some modes of transportation that are considered incompatible with the wilderness concept in other locations are allowed to occur in Alaskan wilderness. Those motorized uses, however, can only be permitted if they are for traditional activities.

Methodology and Assumptions. This section addresses effects on wilderness as a resource, with a focus on two major elements of wilderness: freedom (an open, untrammeled landscape), and naturalness (encompassing opportunities for solitude, or a primitive and remote experience). These qualities of wilderness are established in the literature (e.g., Aplet 2000). The freedom dimension incorporates primarily the character of the landscape and ecosystem (i.e., the notion of a place not under the control of human beings). The naturalness dimension of wilderness is directly affected by changes to the natural environment brought on by disturbance because of human activity, such as auditory and visual pollution, and water pollution due to fuel or other vessel spills. Motorized vessel traffic is more likely to affect characteristics of naturalness than freedom, and thus are given greater weight in this analysis.

Because wilderness consists of functioning ecosystems and natural processes, effects on wilderness are based largely on the effects analyses of the other topics addressed in this EIS. To qualitatively assess changes that would occur to existing wilderness resources through the implementation of each alternative, projections of future wilderness resource conditions were estimated. For the freedom dimension of wilderness, the characteristics used in this analysis are:

- the degree to which land provides opportunities for solitude.
- the remoteness of the land from human activities and development.
- the degree to which ecological processes remain uncontrolled by human agency.

For the naturalness dimension of wilderness, the characteristics used in this analysis are:

- the degree to which the area can provide opportunity for solitude.
- the degree to which the wilderness maintains natural composition.
- the degree to which it remains unaltered by artificial human structure.
- the degree to which it is unpolluted.

Each of these characteristics need not exist at an absolute maximum in wilderness, but collectively they define the qualities of freedom and naturalness, and therefore, facilitate the measurement of wildness in wilderness.

Based on these characteristics just described, the threshold criteria shown in table 4-31 were developed to measure and describe the intensity of effects on wilderness.

TABLE 4-31: THRESHOLD CRITERIA FOR WILDERNESS RESOURCES EFFECTS ANALYSIS

Negligible	Human activity and products of that activity (e.g., air, water, noise pollution) would be present, but would be localized and last less than one day. Overall wilderness values would remain unchanged.
Minor	Human activity and products of that activity (e.g., air, water, noise pollution) would be present, but would be localized and last less than one week.
Moderate	Human activity and products of that activity (e.g., air, water, noise pollution) would be present, occur over a relatively large area or "place," such as an inlet, and last longer than one week or occur so frequently as to be essentially continuous.
Major	Human activity and products of that activity (e.g., air, water, noise pollution) would substantially reduce both the naturalness and freedom dimensions of the wilderness resource at the scale of the entire park. Also, any major effect, within the wilderness area, on another resource, as identified in this EIS, would be considered a major effect on wilderness.

Alternative 1 (No Action) - Effects on Wilderness Resources.

Direct and Indirect Effects on Wilderness Resources – Alternative 1. Throughout most of the Glacier Bay Wilderness, including the expansive glaciers and rugged mountains, vessel traffic is not noticeable, since these areas are remote and isolated from the traffic. Because most wilderness use is shoreline based, and motorized vessels are the primary modes of transportation in the park, human activity affects wilderness mainly along the shoreline in both Glacier and Dundas Bays. Under alternative 1, some currently motorized waters in designated wilderness, upper Dundas Bay and the Beardslee Entrance, would be retained as such.

Overall, the vessel traffic allowed under the current management framework slightly affects wilderness as a resource. The presence of motorized craft creates noise (from engine operation, horns, and public address systems) and contributes pollutants to the air and water. Other effects of vessel traffic include disturbances in feeding and breeding of both marine mammals and birds in Glacier Bay, the intrusion of vessel exhaust into wilderness, and the visual presence of vessels. These effects become greater where

and when vessels concentrate, such as near the tidewater glaciers, but cruise ships only enter one designated wilderness area. Most of the area remains remote with fully functional ecosystems and opportunities for solitude, so the freedom dimension of the landscape would be maintained.

Vessel traffic affects natural conditions in wilderness by emitting air pollutants, particularly where vessel traffic comes near designated wilderness. Depending upon air currents, operating systems, and the amount of ship traffic, particulates from cruise ship emissions may drift over the park's designated wilderness areas; however, emissions would affect only a small fraction of designated wilderness because air emissions disperse, and would be short-lived. Noise can intrude upon the naturalness of the shoreline wilderness. Engine noise can be heard from many places within designated wilderness, particularly where vessels travel close to shore (e.g., South Marble Island). The public address systems of tour and cruise ships also can be heard within wilderness areas.

As a result, motorized vessels do and would continue to decrease the naturalness present in nearby wilderness sections of the park, but would not decrease the freedom dimension, which involves aspects of wilderness at the landscape and/or ecosystem level. Reductions in naturalness would be localized and would not change the overall structure of wilderness in Glacier Bay or Dundas Bay. Seasonal closures to motorized vessels in wilderness waters reduce, but do not completely eliminate the potential for changes to naturalness. Wilderness waters that would remain open to motorized use (Dundas Bay and Beardslee Entrance) would continue to experience decreased naturalness.

Current operating requirements for motorized craft are designed to minimize wildlife disturbance and collisions with whales, and to reduce liquid waste discharges; however, within the narrow inlets/fjords vessel traffic would be concentrated, especially on peak use days. In particular, Tarr and Johns Hopkins inlets, both of which contain spectacular tidewater glaciers, are susceptible to congested conditions and, as described in section 4.2.2, "Air Quality," inversions can sometimes trap vessel emissions, creating a temporary yet noticeable layer of haze that would detract from the natural character of the wilderness shorelines and slopes.

Another area subject to motorized vessels is the Beardslee Entrance. This area is the opening between Young and Strawberry Islands, which is within designated wilderness. This is the only place where cruise ships enter designated wilderness; however, in 2002, only one cruise ship out of 139 entered this area.

Under alternative 1, tour vessels would continue to visit Dundas Bay and the East Arm of Glacier Bay, except during the 6-week periods when Muir and Wachusett Inlets are closed. The shorelines of these areas, like almost all shorelines of the park outside of Bartlett Cove, would be exposed to these vessels, along with private and charter vessels. Some tour vessels are quite large and, within the relatively small Dundas Bay, may be imposing. In addition, tour vessels drop off kayakers who travel in relatively large groups that create noise and visual intrusions into the naturalness of wilderness shorelines of the East Arm and Dundas Bay.

Tour vessels have a relatively high risk factor for grounding and, due to their size, carry significant amounts of fuel, so the presence of tour vessels within Dundas Bay and the East Arm introduces greater potential risk of effects on the wilderness resource from fuel spills. Cruise ships occasionally travel up the East Arm, but since the retreat of the major glaciers in that area, such use would be infrequent, as would the resulting effects of seeing and hearing these vessels.

Dundas Bay, the northern portion of which is designated wilderness, also would remain open without daily limits. Use would be expected to increase for charter vessels, because Dundas Bay provides opportunities for fishing; wildlife viewing; and off-vessel activities, such as kayaking and shore walking — activities ideal for charter operations. In addition, Dundas Bay is one of the few places that remains usable when strong westerly winds (westerlies) blow through Icy Strait. Charter use within Dundas Bay, therefore, could peak on certain days so that 12 or more vessels could be present. Due to the small size of the Bay, this would create a strong human presence and detract from natural conditions, as perceived from the shoreline and from the wilderness waters located in the upper Bay. Peak off-boat activities also would detract from the naturalness of the Bay. This level of activity is expected to disturb wildlife use of the shoreline as well, further reducing the naturalness of the shoreline. The overall direct effects to wilderness resources would be moderate due to the fact that human activity would be localized and short-term.

Cumulative Effects on Wilderness Resources – Alternative 1. The presence of motorized vessels, and the associated effects on wilderness, would be additive to other effects currently detracting from the character of wilderness in the park. Most notable are the effects of hikers and non-motorized boaters within the wilderness. While relatively dispersed, these uses create trails, campsites, and other signs of human use that can detract from the character of the wilderness; so, too, would continued overflights of floatplanes, helicopters, and other aircraft. The Park Service is considering granting mountaineering permits for Mt. Fairweather, located in the Glacier Bay Wilderness Area, that would involve aircraft overflights. These flights, and the noise from other flightseeing and recreational drop-off operations, would detract from

natural conditions. The Park Service itself makes numerous motorized administrative and research trips into the Bay.

Collectively, the effects of these human activities are and would continue to remain minor, since the overall character and functioning of the wilderness would remain intact. These effects have been occurring within the Glacier Bay Wilderness for decades, and the wilderness has remained a wild place, with a functioning natural ecosystem and plentiful opportunities for solitude in the rugged and beautiful landscape.

Impairment Analysis for Wilderness Resources – Alternative 1. Because effects are expected to be minor, the wilderness resource would not be impaired by continued management under the existing regulations.

Potential Mitigation Measures for Wilderness Resources – Alternative 1. A potential way to reduce effects at areas of concentrated use or at attractions such as Tarr and Johns Hopkins Inlets would be to schedule use so that cruise ship and tour vessels would arrive at these places at approximately the same time. Focusing use temporally would concentrate pollutants during one particular time period, and leave more time when no pollutants would be present. This could enhance the naturalness dimension of the wilderness.

Conclusion, Wilderness Resources – Alternative 1. Throughout most of Glacier Bay's remote and rugged wilderness, vessel traffic would not affect the wilderness character of the park. However, within Johns Hopkins and Tarr Inlets the effects of vessel noise and air pollution can be heightened due to the concentrated use in these areas, and the naturalness of upper Dundas Bay and Beardslee Entrance would be impaired because these bodies of water would remain open to motorized vessel use. Coordinating the scheduled arrivals of cruise ships and tour vessels to concentrate traffic and provide more time without traffic could mitigate these effects. Overall, the effect to wilderness resources of alternative 1 would be moderate because the effects occur over a relatively large area (entire bays and inlets) and do so frequently.

Alternative 2 - Effects on Wilderness Resources.

Direct and Indirect Effects on Wilderness Resources – Alternative 2. Overall, alternative 2 would affect wilderness in a manner similar to that described under alternative 1, with relatively minor effects due to the visual presence of vessels, and vessel noise and emissions into the air and water. The vast majority of

the Glacier Bay Wilderness would be unaffected by motorized vessel traffic, except for upper Dundas Bay and Beardslee Entrance. Shoreline areas would be most affected due to their proximity to vessel traffic.

Under alternative 2, fewer cruise ships, charter vessels, and private vessels would be allowed within Glacier Bay during the summer season than are currently allowed. This would result in a slight proportional reduction in associated effects, including, as described in other sections of this EIS, noise disturbances in feeding, nesting, and migration of marine mammals and birds in Glacier Bay, the intrusion of air emissions into wilderness, and the visual presence of vessels. Overall, effects would remain about the same as alternative 1, including the introduction of noise, water, and air emissions to the wilderness shoreline.

As with all alternatives, the motorized vessel-related effects would be localized in concentrated use areas, including Tarr and Johns Hopkins Inlets. Even with fewer vessels allowed over the season, the overall effect would be the same as alternative 1 because the effect would occur during peak use, daily entry limits would be the same as under the current situation.

As with alternative 1, Dundas Bay would remain open to tour vessels and would not have restrictions on entries for any vessel category, resulting in peak use days of charter vessels where up to 12 vessels may be present. The direct effects of alternative 2 on wilderness resources, therefore, would be minor since they are localized and short term.

Cumulative Effects on Wilderness Resources – Alternative 2. Since alternative 2 would affect wilderness in the same manner as alternative 1, the cumulative effect also would be similar and would remain minor for the shoreline of Glacier Bay. Collectively, the effects of backcountry users, aircraft, administrative vessels, and other human activities would remain minor, since the overall character and functioning of the wilderness would remain intact.

Impairment Analysis for Wilderness Resources – Alternative 2. Since the overall character and functioning of the wilderness would remain intact, even when considering cumulative effects, alternative 2 would not impair the Glacier Bay Wilderness resource.

Potential Mitigation Measures for Wilderness Resources – Alternative 2. As described under alternative 1, scheduling use and the timing of vessel entries in concentrated areas could minimize potential reductions of naturalness within designated wilderness.

Conclusion, Wilderness Resources – Alternative 2. Overall effects on wilderness would be similar to the existing situation, with no changes to most of Glacier Bay's wilderness and some reduction of naturalness due to the effects of noise and releases of air and water pollution. Most effects would occur in wilderness waters and along the shorelines. Private vessel numbers under alternative 2 would be the lowest allowed over the summer among all the alternatives, and the number of cruise ships would be reduced, but since peak numbers allowed would remain the same, the overall effect would be essentially the same. While alternative 2 would reduce overall vessel traffic within Johns Hopkins and Tarr Inlets, the effects of vessel noise and air pollution (i.e., reducing "naturalness" along the shorelines and slopes) could be heightened due to the concentrated vessel use in these areas. Cumulative effects from other activities would not substantially contribute to direct effects from alternative 2; therefore, the overall effects are minor based on the localized and short-term nature of the effects described above. Wilderness resources would not be impaired under this alternative.

Alternative 3 - Effects on Wilderness Resources.

Direct and Indirect Effects on Wilderness Resources – Alternative 3. Like alternative 2, the overall effects on wilderness from alternative 3 would be similar to those described under alternative 1. As described in other sections of this EIS, these consequences include noise disturbances in feeding, nesting, and migration to marine mammals and birds in Glacier Bay, the intrusion of air emissions into wilderness, and the visual presence of vessels.

The primary factor that would change from current conditions is that cruise ship numbers could increase to 184 cruise ships from June through August, allowing two cruise ships a day, every day, throughout the summer season. This number of cruise ships would increase the number of events during which congestion would occur in inlets, along with the associated reduction in the character of naturalness. Using the increased percentage of cruise ships (32.4%) under this alternative, the frequency of congestion events when wilderness would be affected would increase by about one-third. The absolute effects of each congestion event would not change, since peak limits (daily entry quotas) would remain the same as under the current management scheme. As with all alternatives, shoreline areas would be most affected due to their proximity to vessel traffic.

Overall effects would remain approximately the same as alternative 1, but would occur more frequently and for a longer seasonal duration, including the introduction of noise, water, and air emissions to the wilderness shoreline. These effects would remain localized. As with alternative 1, Dundas Bay would remain open to tour vessels and would not have restrictions on entries for any vessel category, resulting in peak use days of charter vessels where up to 12 vessels may be present.

Cumulative Effects on Wilderness Resources – Alternative 3. Since alternative 3 would result in similar effects on wilderness as alternative 1, cumulative effects would be similar and would remain minor. Collectively, the effects of backcountry users, aircraft, administrative vessels, and other human activities would continue to remain minor, since the overall character and functioning of the wilderness would remain intact.

Impairment Analysis for Wilderness Resources – Alternative 3. Since the overall character and functioning of the wilderness would remain intact, even when considering cumulative effects, alternative 3 would not impair the Glacier Bay Wilderness resource.

Potential Mitigation Measures for Wilderness Resources – Alternative 3. As described under alternative 1, scheduling use and the timing of vessel entries in concentrated areas could reduce potential reductions of naturalness within designated wilderness.

Conclusion, Wilderness Resources – Alternative 3. Overall effects on wilderness would be similar to alternative 1, and would be minor, although there would be no effects throughout most of Glacier Bay's wilderness. Some reduction of naturalness would occur due to the effects of noise and releases of air and water pollution. Most effects would occur in wilderness waters and along the shorelines. Since alternative 3 allows for up to two cruise ships a day, every day, throughout the summer, crowding events where within Johns Hopkins and Tarr Inlets would occur more frequently. Cumulative effects to wilderness resources from other activities in the park would not significantly contribute to the direct effects of this alternative. Wilderness resources would not be impaired under alternative 3.

Alternative 4 - Effects on Wilderness Resources.

Direct and Indirect Effects on Wilderness Resources –Alternative 4. Several major changes would occur under alternative 4 that would reduce effects to wilderness from those occurring under alternative 1:

- Á the East Arm, Beardslee Entrance, and Dundas Bay would be closed to cruise ships and tour vessels.
- Á daily vessel quotas would be reduced across all vessel categories.
- Á daily and seasonal vessel quotas would be set for charter use in Dundas Bay.
- Á cruise ships would be required to follow designated travel lanes.
- Á seasonal limits would be extended to May and September (currently they only apply from June through August).

Closing the East Arm and Dundas Bay to cruise ships and tour vessels would eliminate effects on naturalness within wilderness that are now occurring from these vessels. These include emissions into the air and water, visual and noise intrusions, and shoreline disturbance and noise resulting from off-vessel activities.

Reducing vessel quotas also would reduce the congestion anticipated in alternatives 1, 2, and 3 that are occurring at the concentration points of Tarr and Johns Hopkins Inlets (and potentially Reid Inlet). The reduction in daily quotas could reduce peak use in these areas, but the daily limit of two cruise ships would remain; however, by keeping the daily limit open to two cruise ships, use could be staggered so that on some days, two cruise ships would enter Glacier Bay, and on other days, none would enter.

By requiring cruise ships to follow a central route up and down Glacier Bay, the distance to wilderness areas would be maximized, thereby providing more of a buffer and lower potential for effects on wilderness. In particular, Beardslee Entrance would be closed to cruise ships under this alternative, thereby eliminating the one place where cruise ships enter designated wilderness. Finally, by extending the period for seasonal restrictions into May and September, the number of days where maximum vessel use occurs would be reduced.

Other effects of vessel traffic, while somewhat reduced, would remain similar to those that would occur under alternatives 1, 2, and 3. As described in other sections of this EIS, these consequences include disturbances in feeding, nesting, and migration to both sensitive marine mammals and birds in Glacier Bay, the intrusion of vessel exhaust into wilderness, and the visual presence of vessels. The direct effects of alternative 4 on wilderness resources would be minor because noise, air emissions, and congestion would be localized and short term.

Cumulative Effects on Wilderness Resources – Alternative 4. As described under the previously addressed alternatives, the presence of motorized vessels, and the associated effects on wilderness, would be

additive to other effects. Most notable are the effects of hikers and non-motorized boaters within the wilderness and overflights of floatplanes, helicopters, and other aircraft. Collectively, the effects of these human activities are and would continue to remain minor, since the overall character and functioning of the wilderness would remain intact.

Impairment Analysis for Wilderness Resources – Alternative 4. Because effects would be expected to be minor, the wilderness resource would not be impaired by continued management under the existing regulations and this alternative represents a refinement of the current operations.

Potential Mitigation Measures for Wilderness Resources – Alternative 4. As described under alternative 1, scheduling use and the timing of vessel entries in concentrated areas could reduce potential reductions of naturalness within designated wilderness.

Conclusion, Wilderness Resources – Alternative 4. Overall effects on wilderness would be similar to the existing situation and would be minor throughout most of Glacier Bay's wilderness. Some reduction of naturalness would occur due to the effects of noise and releases of air and water pollution. Most effects would occur in wilderness waters and along the shorelines. Since alternative 4 provides for the fewest cruise ships among the alternatives, effects related to crowding and air emissions within narrow fjords would be the lowest compared to the other alternatives, including the existing situation. Cumulative effects on wilderness resources from other activities in the park would not significantly contribute to direct effects. Wilderness resources would not be impaired by alternative 4.

Alternative 5 - Effects on Wilderness Resources.

Direct and Indirect Effects on Wilderness Resources – Alternative 5. Most of the same changes that would occur under alternative 4 would also be implemented under alternative 5. The objective of alternative 5 includes, in addition to protecting park resources and values, to increase a variety of use levels and opportunities for park visitors; therefore, vessel levels would remain at current levels, as would most of the effects on wilderness, which are mostly minor. Vessel congestion would continue to occur at two major inlets of the West Arm; however, alternative 5 would contain protective actions, including:

- closing the entrance to Adams Inlet to cruise ships and tour vessels.
- closing Dundas Bay to cruise ships and upper Dundas Bay to tour vessels.
- setting seasonal vessel quotas for charter use (but no daily limit) in Dundas Bay.

- extending seasonal limits to May and September for cruise ships (currently they only apply from June through August).

Closing Dundas Bay to cruise ships would cause a negligible reduction in effects since cruise ships rarely, if ever, currently travel there. Effects of tour vessels would continue in lower Dundas Bay, including noise and air pollution at minor levels (i.e., affecting localized areas and effects lasting no more than a few hours).

Contrasted with alternative 4, alternative 5 would not require cruise ships to follow a central route up and down Glacier Bay; however, Beardslee Entrance would be closed to cruise ships under this alternative, thereby eliminating cruise ships' entryway into designated wilderness.

As opposed to the other alternatives, vessel speed restrictions under alternative 5 would be based on ground speed, rather than speed over the water (see chapter 2 for a detailed discussion). As a result, vessel noise could increase at times when vessels are moving against the current, because the current speed would be added to the ground speed and the vessel would be moving through the water at a faster rate, thereby requiring more engine power and associated noise. Overall, this effect would be minor and would probably represent a negligible change over the existing situation, because most vessels already navigate based on ground speed, even though, technically, they should be using in-water speed. The overall direct effects to wilderness resources under this alternative would be minor because they would be localized and short term.

Cumulative Effects on Wilderness Resources – Alternative 5. As described under the previously addressed alternatives, the presence of motorized vessels, and the associated effects on wilderness, would be additive to other effects. Most notable are the effects of hikers and non-motorized boaters within the wilderness and overflights of floatplanes, helicopters, and other aircraft. Collectively, the effects of these human activities are and would continue to remain minor, since the overall character and functioning of the wilderness would remain intact.

Impairment Analysis for Wilderness Resources – Alternative 5. Because effects are expected to be minor, the wilderness resource would not be impaired by continued management as described under this alternative.

Potential Mitigation Measures for Wilderness Resources – Alternative 5. Scheduling of cruise ships and other vessels could serve to reduce effects in some areas.

Conclusion, Wilderness Resources – Alternative 5. The overall effect to wilderness resources would be minor, although the closure of wilderness waters in Dundas Bay to both tour vessels and cruise ships indicates alternative 5 would have marginally lower effect levels than the current situation. Protective operating requirements would reduce overall effects on the wilderness resource from those currently occurring for cruise ships, and tour and charter vessels. Vessel activity would remain at current levels, as would most of the effects on wilderness, but these are minor because the effects occur at isolated locations and are short term. As with all alternatives, effects would be greatest near the most popular areas, including Tarr and Johns Hopkins Inlets. Cumulative effects from other activities in the park would not significantly contribute to direct effects. Wilderness resources would not be impaired under this alternative.

Summary, Wilderness Resources. None of the alternatives would significantly affect wilderness resources as compared to alternative 1. Most of the Glacier Bay wilderness would remain unaffected by motorized vessel traffic. Shoreline areas would be most affected due to their proximity to vessel traffic, but such effects would be minor, with the exception of the two sensitive areas cited above where scheduling of ships could reduce adverse effects. While overall effects of the alternatives are characterized as minor, alternatives 4 and 5 would have marginally lower effect levels due to reduced vessel quotas and operating requirements.

4.4.5 Local and Regional Socioeconomics

4.4.5 Local and Regional Socioeconomics

This section evaluates the potential effects of implementing the proposed alternatives on local and regional socioeconomics. The effects analysis methodology is presented first, followed by the effects analysis for each alternative. This discussion also includes an evaluation of cumulative effect on local and regional socioeconomics. Conclusions summarize the results of each evaluation.

Impairment is not addressed for this topic because socioeconomics is not a park resource or value subject to the non-impairment standard defined in section 1.3.1 and further defined in NPS policy 1.4.6 (NPS 2001b). As described in chapter 1, the Park Service sets vessel access limits to protect park resources and values. The Park Service has a congressional mandate to protect park resources and values, while no such mandate exists to support local economies; however, mitigation measures are discussed for those alternatives that would have a moderate effect. The park recognizes its role in supporting local economies. As mentioned in this section, Glacier Bay is a major tourist attraction due to its outstanding natural resources, but protection of these resources comes first. Protection of resources does, in fact, protect the economic benefits they provide by leaving them unimpaired for the enjoyment of future generations, as mandated by the Organic Act of 1916.

Issues of Concern Raised during Scoping. The issues related to local and regional socioeconomics that were raised during scoping are:

- Increasing the vessel quota for private and charter vessels and providing access to Dundas and Taylor Bays could improve local economies and lifestyles. Revenues generated from local wildlife viewing and sightseeing charter and tour vessels could replace loss of livelihood resulting from the Glacier Bay commercial fishing phase-out.
- Increasing the number of permits allocated to local owners and operators could benefit the local economy, but the number of vessel entries should not increase.
- Increasing the vessel quota for tour vessels could benefit the economy of local communities by providing additional entries to local operators. Increased restrictions on local resident access could have detrimental effects to local economies.
- Increasing the vessel quota for private, locally based vessels would benefit inn and lodge operators by increasing their access to Glacier, Dundas, and Taylor Bays for their guests.

Issues raised during scoping related to the cumulative effect on the environment from the incremental effect of other actions include the following:

- Commercial fishing is being phased out of Glacier Bay and Dundas Bay wilderness waters, but will continue until all current permit holders cease to fish. (The waters outside Glacier Bay are open to commercial fishermen.)

- Some commenters have the perception that tourism in Southeast Alaska is leveling out, and fewer independent travelers are coming to the park. These conditions may alter demand and the type of visitor experience preferred.
- The number of charter vessel operators is increasing, which could result in increased demand for permits.

Methodology and Assumptions. The analysis of effects on local and regional socioeconomics is focused on businesses and the local economies within which they operate. It identifies businesses that currently economically benefit, either directly or indirectly, from access to Glacier Bay based on NPS vendor and permit lists and other sources. Several research tools were used to assess business response to changing vessel quotas, including an analysis of cruise line and other business reactions (i.e., itinerary changes, pricing adjustments, etc.) to past changes in Glacier Bay permits, interviews with cruise line marketing managers, as well as professional judgement and experience in Alaska cruise and tourism marketing strategies and considerations in the development of Alaska itineraries.

Each alternative is analyzed in terms of its potential effect on local personal income. The change in personal income in each community resulting from each alternative is assumed by be proportional the change in permitted vessel traffic. This assumption is based on the fact that Glacier Bay is the premiere attraction in Southeast Alaska, and vessel bookings would be significantly lower for trip itineraries that do not include a visit to the park. For example, if it is assumed that cruise ship-related activity in Juneau accounts for 6% of that community's total personal income and an alternative results in a 33% reduction in cruise ship access to Glacier Bay, it can be further assumed that this alternative would result in a 2% reduction in personal income in Juneau. This relationship between Glacier Bay vessel traffic and local area personal income is described in more detail in chapter 3. This analysis includes indirect effects, those that occur as a result of a change in activity by directly affected businesses, such as purchases of goods and services by individuals who are employed directly by vessel-related businesses.

Finally, cumulative effects, including total changes in income are overlain on the baseline community and regional socioeconomic environment to assess the relative importance of economic change resulting from higher or lower vessel quotas. Baseline community and regional data is drawn from secondary data sources, including the 2000 U.S. Census, Alaska Department of Labor and Workforce Development, Bureau of Economic Analysis, and others. The intensities of effects on communities are described in table 4-32.

TABLE 4-32: THRESHOLD CRITERIA FOR LOCAL AND REGIONAL SOCIOECONOMICS EFFECTS ANALYSIS

Negligible	The effect would not be detectable and would not change the socioeconomic environment, including individuals, businesses and communities with economic linkages to the park.
Minor	A community-level economic effect would be measurable, but small relative to the size of overall economies. In the smaller communities (Gustavus, Hoonah, Pelican, Skagway, or Elfin Cove) effects would be considered minor if there could be an overall (economy-wide) change in employment and personal income of less than 5%. In larger communities (Juneau, Sitka, and Haines) effects would be considered minor if there could be an overall (economy-wide) change in employment and personal income less than 1%.
Moderate	The effect would be clearly detectable and could reduce the socioeconomic environment. In the smaller communities (Gustavus, Hoonah, Pelican, Haines, or Elfin Cove) effects would be considered moderate if there could be an overall (economy-wide) change in employment and personal income of greater than 5%, but less than 10%. In larger communities (Juneau, Sitka, or Ketchikan) effects would be considered moderate if there could be an overall (economy-wide) change in employment and personal income greater than 1%, but less than 3%.
Major	The effect would have a substantial, highly noticeable, potentially permanent influence on the socioeconomic environment. More than one-quarter of people and businesses with economic linkages to the park would be affected. In the smaller communities effects would be considered major if there could be an overall (economy-wide) change in employment and personal income of greater than 10%. In larger communities effects would be considered major if there could be an overall (economy-wide) change in employment and personal income of greater than 3%.

Alternative 1 (No Action) – Effects on Local and Regional Socioeconomics.

Direct and Indirect Effects on Local and Regional Socioeconomics – Alternative 1. The economic linkages between visitation in the park and local and regional economies are widespread and complex. Alternative 1, however, would have negligible direct or indirect effects on the local economies of Southeast Alaska, including cruise line ports of call such as Haines, Skagway, Juneau, Sitka, and Ketchikan. These communities benefit from cruise ship passenger spending, cruise line spending (moorage fees, stevedoring, etc.), and the tax revenues stemming from that spending. Cruise passengers spent just under $200 million in southeast communities in 1999, the latest available data (McDowell 2000d). Cruise ship passengers spend an average of $120 each in Juneau, approximately $100 in Ketchikan and Skagway, and lesser amounts in Sitka and Haines. Cruise lines spent another $22 million on maritime services and other goods in services in direct support of their Southeast Alaska operations (McDowell 2000d). Access to Glacier Bay is linked to the economic well-being of these ports-of-call because the inclusion of Glacier Bay in a cruise itinerary can determine which communities are also included in the itinerary, and whether or not the ship travels cross-Gulf. The seven cruise ship lines, five tour vessel operators, 13 charter vessels, and other private vessels would continue to operate.

Similarly, the economies of park neighboring communities of Gustavus, Hoonah, Pelican, and Elfin Cove would not be directly affected in alternative 1. The economies of these communities have adjusted to the current number of vessel entries. Under alternative 1, there would be no change in local employment, payroll, tax revenues, or other economic indicators. These small communities have varying levels of economic dependence on Glacier Bay visitation. Gustavus is most dependent, as the gateway community for most the park's independent (non-cruise) visitors. Gustavus is also the location of Park headquarters. Hoonah, Pelican and Elfin Cove are less economically dependent, with links primarily associated with access to the park for charter boats. Hoonah has important socio-cultural links to the park, as described in chapter 3. The local communities would continue to benefit from visitor fees collected and spent locally by the Park Service.

Alternative 1 would have negligible direct effects on Glacier Bay-dependent businesses, charter boat operators, lodging establishments, cruise lines, and tour boat operators. As the no action alternative, no increase or decrease in business sales would be associated with alternative 1; however, there would be a minor long-term effect on Alaska's visitor industry. For example, for the cruise industry, Glacier Bay is the premier attraction on an Alaska cruise itinerary, and cruise ship passenger demand exceeds the available opportunities to visit the Bay, based on the high level of interest among cruise lines in acquiring Glacier Bay permits and on interviews with cruise line marketing managers. The opportunity to view glaciers is the single most important reason visitors travel to Alaska (GMA Research Corporation 2000). In general, Alaska cruises that include Glacier Bay in the itinerary are more popular and sell faster than cruise itineraries without Glacier Bay, according to cruise industry officials, but alternative glaciers accessible by vessels exist. Although some scoping comments included the perception that tourism in southeast Alaska is declining, Alaska's cruise industry is expected to see growth in passenger capacity averaging five to six percent a year over the next five years, including a 10 percent increase in 2003 (based on unpublished McDowell Group data; McDowell 2002a). In the absence of additional cruise ship entries, cruise lines would not increase the number of tours that include Glacier Bay, resulting in a potentially smaller proportion of the total number of visitors to Alaska who travel to Southeast Alaska.

Similarly, businesses in the smaller communities with linkages to Glacier Bay, such as Elfin Cove sport fishing lodge operators, would not experience a change in sales or employment as a result of alternative 1. Some operators would, however, continue to experience difficulty in obtaining permits for Dundas Bay, as expressed in public hearings held during the scoping phase of this project.

Alternative 1, would not directly affect local and regional economies in Southeast Alaska. Alternative 1 would maintain personal income and employment for businesses and local economies that are dependent on Glacier Bay at current levels. Future growth in Alaska's visitor industry would be limited to the extent that the demand for access to Glacier Bay exceeds the vessel quotas, if any, a minor effect; therefore the overall direct and indirect effects of implementing alternative 1 would be minor.

Cumulative Effects on Local and Regional Socioeconomics – Alternative 1. A broad range of factors influence the local and regional economies of Southeast Alaska. Some smaller communities, such as Pelican, will continue to struggle with changing conditions in the seafood industry, including commercial fishing restrictions in Glacier Bay, declining fish markets, and recent changes in fisheries management, such as the individual fisherman's quota system for the halibut and blackcod fisheries, which has adverse effects on remote processors. Some residents of Pelican, Hoonah, and Gustavus hold the opinion that changes in vessel management in Glacier Bay, such as setting more permits for local charter operators, could benefit their local economies; however, alternative 1 does not include such changes.

These communities and local residents are slated to receive monetary compensation from the federal government for lost income due to the Glacier Bay closures. The Glacier Bay Compensation Plan Economic Assessment predicted potential economic losses to fishermen, processors, communities and others between $23 million and $59 million. The federal government has made available a total of $31 million for the compensation program (McDowell 2000a). Assuming that changes in personal income and employment would increase in proportion to the percent employed in visitor-affected businesses and the 5% or 6 % annual growth of the visitor industry, this effect would be minor to communities such as Hoonah, Pelican, Juneau, and Sitka and moderate in Gustavus, Elfin Cove, Haines, and Yakutat.

Insofar as alternative 1 will not produce changes in local and regional economies, the cumulative economic effects are negligible.

Impairment Analysis for Local and Regional Socioeconomics – Alternative 1. Socioeconomics is not a park resource or value, and so is not subject to the non-impairment standard defined in section 1.3.1 and further defined in NPS policy 1.4.6.

Potential Mitigation Measures for Local and Regional Socioeconomics – Alternative 1. None required.

Conclusion, Local and Regional Socioeconomics – Alternative 1. The direct and indirect adverse effects of the implementation of alternative 1 are minor. The cumulative considerations would not produce any independent changes to local and regional economies. No mitigation measures would be necessary and impairment does not apply to this resource; therefore, the overall effects of this alternative are minor adverse effects.

Alternative 2 – Effects on Local and Regional Socioeconomics. Under alternative 2, vessel management would revert to the quotas and operating requirements that were established in 1985 and were in place prior to the 1996 decision to increase vessel numbers. Cruise ship seasonal entries would decrease from the current 139 entries to 107; charter boat entries would decrease from 312 to 271; private boat entries would decrease from 468 to 407; and tour vessel entries would remain the same. Also under alternative 2, management or vessel entries in Dundas Bay would not change.

Direct and Indirect Effects on Local and Regional Socioeconomics –Alternative 2. Communities whose economies benefit from cruise, charter, and private boat tourism in Glacier Bay would experience lower business sales and lower employment, causing a minor to moderate effect on local personal income. The actual distribution of adverse economic effects among communities would depend on the specifics of the quotas, i.e., how the reductions would be implemented, which has not been determined. Personal income for local residents of the neighboring communities of Gustavus, Hoonah, Pelican, and Elfin Cove would be expected to decline due to reduced business activity for charter operators stemming from a 13% reduction in charter permits and reduced local spending associated with private vessel traffic (also 13%). As described in the methodology, personal income reductions in these smaller communities of less than 5% are considered a minor adverse effect. In Gustavus, where a significant amount of charter activity is based, and where there is some economic dependence on cruise ship passenger fees, reductions of about 5% would be predicted; therefore adverse effects in Gustavus would be considered moderate.

Economic effects of a 23% reduction in cruise permits on the cruise port of call communities of Skagway, Haines, Juneau, and Sitka (as well as other Southeast ports of call) would be moderate, depending on the community. Juneau and Sitka would be expected to experience, over the long-term, declines in personal income of about 1% annually, considered a moderate effect. Skagway, the Southeast community with the highest level of economic dependence on cruise traffic, could experience an annual personal income decline of about 5%, also defined as a moderate effect. In the short-term, cruise line traffic could increase or decrease to any given community because, with Glacier Bay not available (or less available) cruise lines will look for other glacier experiences to offer their passengers, such as Tracy Arm. Some

communities could see an increase in the number of port calls, while others might experience some decline. It is not possible to predict which communities would experience short-term reductions or increases in cruise ship traffic.

It is important to that note even over the short-term the potential adverse consequences of alternative 2 on any single community are significant. For example, if one ship that now visits Haines were to re-deploy (because of changes in Glacier Bay vessel quotas) to a cross-Gulf itinerary and drop Haines, the community could lose $2 million in local passenger spending, assuming 22 stops per season, 2,000 passengers per stop, and average spending of $55 per passenger (McDowell 2000b). This loss in local spending would translate into less personal income for Haines residents and, potentially, less employment. Over the long-term, reductions in cruise ship access to Glacier Bay would be expected to push more traffic cross-gulf resulting in fewer Southeast port calls. This would result in lower personal income in these communities, as described above.

In summary, the economies of communities with economic linkages to Glacier Bay would experience minor to moderate adverse income and employment effects form alternative 2. Gustavus is the community most likely to experience moderate adverse economic effects, though other communities could also experience moderate effects, depending on cruise decisions on rerouting vessels. The overall direct and indirect effects of alternative 2 would be moderate.

Cumulative Effects on Local and Regional Socioeconomics – Alternative 2. Moderate cumulative adverse effects would be associated with alternative 2. Personal income in Gustavus, Pelican, Hoonah, and Elfin Cove have been and will remain depressed due to commercial fishing closures and restrictions in Glacier Bay, and other management and market issues facing the fishing industry as a whole. These effects may be partially offset by positive short-term effects from the monetary compensation to commercial fishers by the federal government. The effects of commercial fishing restrictions, coupled with the reduction in the number of vessel entry permits for the Bay, would result in moderate employment and income losses in the smaller communities in the Glacier Bay area. Effects to the larger communities would be moderate, although potentially major in communities where cruise ships would cease to call.

Impairment Analysis for Local and Regional Socioeconomics – Alternative 2. Socioeconomics is not a park resource and so is not subject to the non-impairment standard.

Potential Mitigation Measures for Local and Regional Socioeconomics – Alternative 2. Measures that could mitigate the adverse cumulative effects of alternative 2 could include using the preferred operator criteria (36 CFR 13.83) for selecting charter vessel permits, which could mitigate effects in Gustavus, Hoonah, Elfin Cove, and Pelican.

Conclusion, Local and Regional Socioeconomics – Alternative 2. The overall direct and indirect effects would be moderate. Including cumulative effects, all of the park's smaller neighboring communities could experience moderate adverse economic effects, which could be mitigated to some extent by using preferred operator criteria. Impairment does not apply to this topic. The overall effect on local and regional socioeconomics of implementing alternative 2 would be moderate.

Alternative 3 – Effects on Local and Regional Socioeconomics. Alternative 3 would continue the current vessel management activities and operating restrictions, but would allow future increases in vessel traffic up to the quotas authorized in the 1996 vessel management plan. Cruise ship entries would still be restricted to a maximum of two per day, but the total number of allowable entries for the season would increase from 139 to 184. All other vessel quotas would remain the same as in alternative 1. Alternative 3 does not propose any changes in the management or vessel entries in Dundas Bay.

Direct and Indirect Effects on Local and Regional Socioeconomics –Alternative 3. Alternative 3 would have moderate positive effects on local economies dependent on cruise ship traffic in Southeast Alaska. It is possible that more ships could operate as Inside Passage cruises, rather than as cross-Gulf cruises, and as a result there would be more passenger spending in ports-of-call, as well as more tax and ship fee revenue collected by local governments and private dock owners. More local spending associated with an increase in traffic would increase employment and payroll in Southeast Alaska ports-of-call.

Economic effects in the smaller communities near the park and the effects associated with other vessel traffic would be the same as described in alternative 1. That is, effects would be negligible. The one exception would be Gustavus, which would benefit from increased NPS revenues from cruise ship passenger fees.

In summary, alternative 3 would have moderate positive effects on Southeast Alaska ports-of-call. Effects on other communities would be negligible, with the exception of Gustavus, which would benefit from increased passenger fees flowing to the Park Service; therefore, the overall direct and indirect effects would be moderate positive effects.

Cumulative Effects on Local and Regional Socioeconomics – Alternative 3. There are no cumulative considerations under alternative 3 that would result in effects measurably different from those identified for alternative 3 alone.

Impairment Analysis for Local and Regional Socioeconomics – Alternative 3. Socioeconomics is not a park resource and so is not subject to the non-impairment standard.

Potential Mitigation Measures for Local and Regional Socioeconomics – Alternative 3. No mitigation is necessary under alternative 3.

Conclusion, Local and Regional Socioeconomics – Alternative 3. Implementation of alternative 3 would result in moderate positive direct and indirect effects. No mitigation measures would be necessary and impairment does not apply to this topic. The overall effect of this alternative would be moderate positive effects.

Alternative 4 – Effects on Local and Regional Socioeconomics. Under alternative 4, the season would be extended to May through September. Seasonal entry quotas for cruise ships would decrease to 92 June through August. Tour vessels would be limited to two vessels per day, a reduction from the three per day limit under alternative 1. June through August tour vessel seasonal-use days would be reduced from 276 to 184. Charter boat entries would be reduced from six to five per day, with seasonal-use days reduced from 552 to 460 in Glacier Bay. Daily entries for private vessels would be reduced from 25 to 22, though seasonal-use days would increase from 1,971 to 2,024. For Dundas Bay, tour vessels would no longer be allowed under alternative 4, and charter vessels would be restricted to three per day and 459 seasonal use days in the season.

Direct and Indirect Effects on Local and Regional Socioeconomics – Alternative 4. Moderate adverse local and regional economic effects would be associated with alternative 4, with the exception of Gustavus, where effects would be major. Personal income for local residents within Gustavus, Hoonah, Pelican, and Elfin Cove could decline as a result of a potential 17% reduction in business activity for charter operators. Gustavus's economy would be adversely affected by a 34% reduction in June-to-August cruise ship passenger fees paid to the Park Service. The community's economy also would be affected by the 33% reduction in tour vessel use days during the June through August period; however, this effect may be positive for the community of Gustavus. If tour vessel quotas are reduced, it would not

be the *Spirit of Adventure*, which is the only tour boat contributor to the Gustavus economy. If one or more of these tour boats were eliminated, then a percentage of the visitors who might otherwise have booked passage on that boat might be inclined to stay in Gustavus or at Glacier Bay Lodge and take the *Spirit of Adventure*. So, reduction of tour boats by 33% would not have a negative effect on Gustavus's economy, but could have a positive one. As described in Chapter 3, it is assumed that about two-thirds (65%) of Gustavus's economy (measured in terms of personal income) is dependent on visitor travel. Cruise (10%), tour (50%) and charter (15%) activity are assumed to collectively account for about 75% of the local visitor economy. A 34% reduction in cruise-related income in the economy, 33% reduction in tour vessel related income, and a 17% reduction in charter-related income in the economy would result in an overall local personal income loss of about 15%.

The communities of Hoonah, Elfin Cove, and Pelican, which are not economically dependent on Glacier Bay cruise or tour vessel activity, would experience minor adverse effects, associated with a decline in charter vessel permits, with overall personal income declines of less than 5%.

The cruise line port of call communities of Skagway, Haines, Juneau, and Sitka could experience adverse economic effects (ranging from minor to major, depending on location) from alternative 4. In the short-term, these communities could experience some change in cruise line traffic, as a result of rerouting of cruise itineraries. As described under alternative 2, with fewer Glacier Bay entry opportunities, cruise lines will look for other glacier experiences to offer their passengers, such as Tracy Arm or Hubbard Glacier. This may or may not result in a decline in traffic to a particular community. A decline in cruise ship traffic to a community can affect local spending by cruise lines and cruise passengers, which can result in reduced local employment and income. If the 34% reduction in were to, over the long-term, result in 34% less cruise traffic to Southeast Alaska ports-of-call, the effects would be relatively greatest in Skagway, which is most dependent on the cruise industry. A 34% reduction in cruise traffic to Skagway could result in a 10% decrease in annual personal income. This estimate is based on the assumption that about 60% of Skagway's economy is dependent on cruise ship traffic, and about half of that traffic also visits Glacier Bay. If alternative 4 results in a 34% reduction in the Glacier Bay component of Skagway's cruise traffic (meaning a 17% reduction in total Skagway cruise traffic), the community could expect to experience a 10% decline in total personal income. This is defined as a major effect. Using the same basic methodology, Juneau, Sitka and Haines, could experience personal declines of between 1% (Juneau) and 3% (Haines), considered moderate adverse effects.

In summary, communities with economic linkages to Glacier Bay would experience major adverse economic effects from alternative 4. Gustavus, and potentially Skagway are the communities that could experience major economic effects. Including cumulative effects, all the parks' smaller neighboring communities would experience major adverse economic effects associated with alternative 4. The overall direct and indirect adverse effects resulting from implementation of this alternative would be major.

Cumulative Effects on Local and Regional Socioeconomics –Alternative 4. The cumulative economic effects associated with alternative 4 would be similar, but more adverse, than those described under alternative 2. The economies of Gustavus, Pelican, Hoonah, and Elfin Cove are reduced due to the combination of commercial fishing closures and restrictions in Glacier Bay and restricted visitor vessel entry permits for the Bay. This cumulative effect of alternative 4 would result in moderate (up to 10%) employment and income losses in the smaller communities in the Glacier Bay area. The employment and income losses could be up to 20% in Gustavus, a major adverse effect.

Impairment Analysis for Local and Regional Socioeconomics – Alternative 4. Socioeconomics is not a park resource and so is not subject to the non-impairment standard.

Potential Mitigation Measures for Local and Regional Socioeconomics – Alternative 4. Mitigation measures under alternative 4 are similar to those identified under alternative 2. Using the preferred operator criteria (36 CFR 13.83) for selecting charter vessel permits could mitigate effects to Gustavus, Hoonah, Elfin Cove, and Pelican to some extent.

Conclusion, Local and Regional Socioeconomics – Alternative 4. Implementation of alternative 4 would result in major adverse direct and indirect effects to local and regional economies. Cumulative adverse effects would be moderate; therefore, mitigation measures could alleviate this effect to some extent. Impairment does not apply to this topic. The overall effect of this alternative on local and regional socioeconomics would be major adverse effects, depending on the location.

Alternative 5 – Effects on Local and Regional Socioeconomics. Under alternative 5, cruise ship entries would remain at 139 from June through August and would be limited to 92 in May and September. (Under current regulations, up to 62 cruise ships can enter the Bay in May and 60 may enter in September.) This alternative also includes additional vessel operating requirements on vessel speeds, location of whale waters, and pollution control measures. In Dundas Bay, no cruise ships would be

allowed; one tour vessel per day would be allowed in the lower Bay only; charter vessels would not have a daily limit, but would be allowed 276 total use days; and private vessels would have unlimited entries.

Direct and Indirect Effects on Local and Regional Socioeconomics – Alternative 5. The economic effects of alternative 5 generally would be similar to those described under alternative 1. That is, there would be negligible effects on local economies and businesses. Regarding effects on cruise lines, the reduced number of May and September cruise ship entries exceeds the actual number of cruise ship entries during those two months in 2001; therefore, the economic effects would be negligible.

The changes in Dundas Bay management included in alternative 5 could have minor positive economic effects on commercial users of Dundas Bay. Dundas Bay is typically a secondary attraction or destination for charter boat visitors, many of whom are in the area primarily to saltwater sport fish from lodges in Elfin Cove. Primary saltwater sport-fishing areas are in the Cross Sound area; however, Dundas Bay is an important alternative destination when bad weather pushes the charter boats off the prime fishing grounds, and for wildlife viewing, crab fishing, and other activities. In alternative 5, charter vessels frequenting Dundas Bay will have no daily vessel quota and separate charter vessel quotas will be established for Glacier Bay. The seasonal use days limits under alternative 5 are the same as current use-day limits for charters. This should provide more flexibility for charter operators and may allow for slightly more visitation than is now occurring.

In summary, the overall direct and indirect effects of this alternative on local and regional socioeconomics would be minor positive effects.

Cumulative Effects on Local and Regional Socioeconomics – Alternative 5. Cumulative economic effects would be similar to those described under alternative 1. Alternative 5 will not produce measurable direct or indirect adverse changes in local and regional economies, therefore the cumulative economic effects are considered negligible.

Impairment Analysis for Local and Regional Socioeconomics – Alternative 5. Socioeconomics is not a park resource and so is not subject to the non-impairment standard.

Potential Mitigation Measures for Local and Regional Socioeconomics – Alternative 5. No mitigation measures are necessary for alternative 5.

Conclusion, Local and Regional Socioeconomics – Alternative 5. Implementation of alternative 5 would result in negligible adverse and minor positive direct and indirect effects to local and regional economies. Cumulative considerations would not produce any independent changes to local and regional economies. Mitigation measures would not be necessary if this alternative is implemented. Impairment does not apply to this topic. Alternative 5 would result in negligible effects on local and regional economies in Southeast Alaska.

Summary, Local and Regional Socioeconomics. Alternatives 1 and 5 would have minor effects on local communities and ports-of-call for the cruise industry. Alternatives 2 and 4 would result in major reductions in direct and indirect spending by cruise lines and passengers. Alternative 3 would provide moderate economic benefits to local communities and cruise ship ports of call. Because other economic activities such as fishing and timber harvesting are declining, the cumulative effects on the visitor industry of changes in vessel quotas would be greater than the vessel quotas alone, but would remain moderate.